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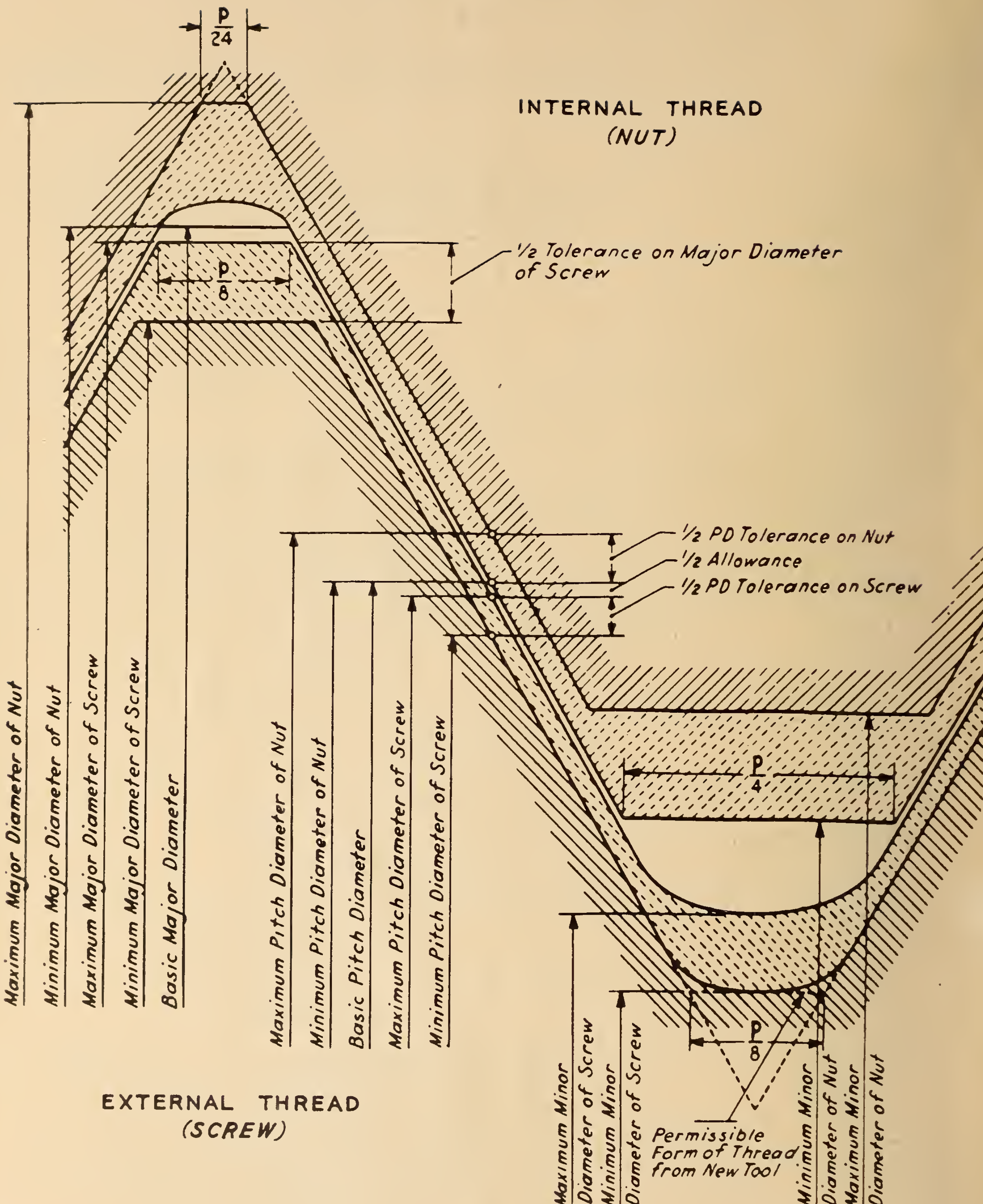
COVER PICTURE

One of the most spectacular of Canada's industrial achievements in the second World War was the setting up of the synthetic rubber plant of the Polymer Corporation at Sarnia. In peacetime the project would have taken three years to build. Under war pressure in 1942-43, its eight acres of permanent buildings, six miles of sewers, five miles of roads, and complicated mosaic of pipes, conduits, spheres, and towers were completed in a year and eight months. Unlike many war-born enterprises it has continued, even expanded its operations since the war's end, and is now producing synthetic rubber at a rate of over 100,000,000 pounds per year. Designed annual output was 83,600,000 lbs.

The cover photo shows Butadiene pressure storage tanks used in the latter stages of the production of GR-S rubber.



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UNIFICATION OF SCREW THREAD STANDARDS

From a Report issued by:

NATIONAL BUREAU OF STANDARDS. U.S. DEPARTMENT OF COMMERCE, WASHINGTON, D.C.

On Thursday, November 18, delegates and representatives from government and industry of Canada, the United Kingdom, and the United States met at the National Bureau of Standards, Washington, D.C., to sign an accord on unification of the American and British standard systems of screw threads. The accord, representing the culmination of 30 years of effort among the three nations, affirms the unification represented in revised publications of the Interdepartmental Screw Thread Committee of the United States of America and of the British Standards Institution, the Canadian Standards Association, and the American Standards Association. These documents fulfil all the requirements for general interchangeability of threaded products made in the three nations. Not only is the accord of major significance in expanding and facilitating commerce between the cooperating nations, but it also is an important step toward the further development and extension of unifying standards in other fields of engineering practice.

The Signatories

Signers of the accord, representing Canada, were C. D. Howe, Hon. M.E.I.C., Minister of Trade and Commerce, and J. G. Morrow, chairman, Canadian Standards Association; W. L. Batt, also an Honorary Member of the Institute, was one of the signatories for the United States. The Unified Standards will be made effective in the Departments of the U.S. Government by inclusion in the next revision of Handbook H28, *Screw Thread Standards for Federal Services*, of the National Bureau of Standards.

Significance of the Accord

The significance of the accord is patent in the field of commerce. Almost all mechanisms and structures of modern technologic societies are held together by fasteners—bolts, nuts, screws, and rivets. For example, to cite an extreme case, there are 122,000 screws in one type of aeroplane. Economic production in the automotive, aircraft, agricultural implement, and other industries using assembly-line methods requires not only a steady supply of components but also that the components, including large numbers of fasteners, be interchangeable so that they can be fitted together without selection, subsequent machining, or hand-fitting of any kind.

Past Difficulties

In the past, international trade in mechanisms of all kinds has been seriously handicapped by the lack of interchangeability of screw thread parts. This has required the manufacturing nation also to supply and distribute such parts along with the equipment it wishes to market in a foreign area. Furthermore, the question of the availability of such parts has acted as a psychological deterrent to purchasers of products from other nations. These limitations on the international commerce of Canada, the United Kingdom, and the United States will gradually disappear as the unified standards are acted upon by the industries of the three Nations in the ensuing years.

During the first world war, the experience of the allied American and British armed forces revealed that the lack of interchangeability of American and British screw threads was a serious problem. In World War II, the high degree of mechanization of all military forces made the problem even more serious than it had been. American industry was required to supply the British with a large volume of war equipment threaded to the British specification. This not only led to considerable delay but was economically disadvantageous. At the same time, American military forces based in England and using equipment with American threads found difficulties in making necessary replacements.

TABLE 1.—BASIC DIMENSIONS OF UNIFIED COARSE THREAD SERIES[1]

Sizes	Basic Major Diameter D	Threads per Inch n	Basic Major Diameter E	Minor Diameter External Threads K_s	Minor Diameter Internal Threads K_n	Lead Angle at Basic Pitch Diameter		Section at Minimum Minor Diameter	Stress Area[2]
	Inches		Inches	Inches	Inches	Deg	Min	Sq. In.	Sq. In.
1 (.073)	0.0730	64	0.0629	0.0538	0.0561	4	31	0.0022	0.0026
2 (.086)	.0860	56	.0744	.0641	.0667	4	22	.0031	.0036
3 (.099)	.0990	48	.0855	.0734	.0764	4	26	.0041	.0048
4 (.112)	.1120	40	.0958	.0813	.0849	4	45	.0050	.0060
5 (.125)	.1250	40	.1088	.0943	.0979	4	11	.0067	.0079
6 (.138)	.1380	32	.1177	.0997	.1042	4	50	.0075	.0090
8 (.164)	.1640	32	.1437	.1257	.1302	3	58	.0120	.0139
10 (.190)	.1900	24	.1629	.1389	.1449	4	39	.0145	.0174
12 (.216)	.2160	24	.1889	.1649	.1709	4	1	.0206	.0240
¼	.2500	20	.2175	.1887	.1959	4	11	.0269	.0317
5/16	.3125	18	.2764	.2443	.2524	3	40	.0454	.0522
⅜	.3750	16	.3344	.2983	.3073	3	24	.0678	.0773
7/16	.4375	14	.3911	.3499	.3602	3	20	.0933	.1060
½	.5000	13	.4500	.4056	.4167	3	7	.1257	.1416
½	.5000	12	.4459	.3978	.4093	3	24	.1205	.1374
9/16	.5625	12	.5084	.4603	.4723	2	59	.1620	.1816
⅝	.6250	11	.5660	.5135	.5266	2	56	.2018	.2256
¾	.7500	10	.6850	.6273	.6417	2	40	.3020	.3340
⅞	.8750	9	.8028	.7387	.7547	2	31	.4193	.4612
1	1.0000	8	.9188	.8466	.8647	2	29	.5510	.6051
1⅛	1.1250	7	1.0322	.9497	.9704	2	31	.6931	.7627
1¼	1.2500	7	1.1572	1.0747	1.0954	2	15	.8898	.9684
1⅜	1.3750	6	1.2667	1.1705	1.1946	2	24	1.0541	1.1538
1½	1.5000	6	1.3917	1.2955	1.3196	2	11	1.2938	1.4041
1¾	1.7500	5	1.6201	1.5046	1.5335	2	15	1.7441	1.8983
2	2.0000	4½	1.8557	1.7274	1.7594	2	11	2.3001	2.4971
2¼	2.2500	4½	2.1057	1.9774	2.0094	1	55	3.0212	3.2464
2½	2.5000	4	2.3376	2.1933	2.2294	1	57	3.7161	3.9976
2¾	2.7500	4	2.5876	2.4433	2.4794	1	46	4.6194	4.9326
3	3.0000	4	2.8376	2.6933	2.7294	1	36	5.6209	5.9659
3¼	3.2500	4	3.0876	2.9433	2.9794	1	29	6.7205	7.0992
3½	3.5000	4	3.3376	3.1933	3.2294	1	22	7.9183	8.3268
3¾	3.7500	4	3.5876	3.4433	3.4794	1	16	9.2143	9.6546
4	4.0000	4	3.8376	3.6933	3.7294	1	11	10.6084	11.0805

[1]All values represent complete unification among the American, British, and Canadian standards for Unified threads with the exception of those in light face type. The latter will appear in the American publications but do not constitute a part of the Unified system.

[2]Based on the average of the mean minor and pitch diameters of the external thread.

TABLE 2.—BASIC DIMENSIONS OF UNIFIED FINE THREAD SERIES[1]

Sizes	Basic Major Diameter D	Threads per Inch n	Basic Pitch Diameter E	Minor Diameter External Threads K_s	Minor Diameter Internal Threads K_n	Lead Angle at Basic Pitch Diameter		Section at Minimum Minor Diameter	Stress Area[2]
	Inches		Inches	Inches	Inches	Deg	Min	Sq. In.	Sq. In.
0 (.060)	0.0600	80	0.0519	0.0447	0.0465	4	23	0.0015	0.0018
1 (.073)	.0730	72	.0640	.0560	.0580	3	57	.0024	.0027
2 (.086)	.0860	64	.0759	.0668	.0691	3	45	.0034	.0039
3 (.099)	.0990	56	.0874	.0771	.0797	3	43	.0045	.0052
4 (.112)	.1120	48	.0985	.0864	.0894	3	51	.0057	.0065
5 (.125)	.1250	44	.1102	.0971	.1004	3	45	.0072	.0082
6 (.138)	.1380	40	.1218	.1073	.1109	3	44	.0087	.0101
8 (.164)	.1640	36	.1460	.1299	.1339	3	28	.0128	.0146
10 (.190)	.1900	32	.1697	.1517	.1562	3	21	.0175	.0199
12 (.216)	.2160	28	.1928	.1722	.1773	3	22	.0226	.0257
¼	.2500	28	.2268	.2062	.2113	2	52	.0326	.0362
5/16	.3125	24	.2854	.2614	.2674	2	40	.0524	.0579
⅜	.3750	24	.3479	.3239	.3299	2	11	.0809	.0876
7/16	.4375	20	.4050	.3762	.3834	2	15	.1090	.1185
½	.5000	20	.4675	.4387	.4459	1	57	.1486	.1597
9/16	.5625	18	.5264	.4943	.5024	1	55	.1888	.2026
⅝	.6250	18	.5889	.5568	.5649	1	43	.2400	.2555
¾	.7500	16	.7094	.6733	.6823	1	36	.3513	.3724
⅞	.8750	14	.8286	.7874	.7977	1	34	.4805	.5088
1	1.0000	12	.9459	.8978	.9098	1	36	.6245	.6624
1⅛	1.1250	12	1.0709	1.0228	1.0348	1	25	.8118	.8549
1¼	1.2500	12	1.1959	1.1478	1.1598	1	16	1.0237	1.0721
1⅜	1.3750	12	1.3209	1.2728	1.2848	1	9	1.2602	1.3137
1½	1.5000	12	1.4459	1.3978	1.4098	1	3	1.5212	1.5799

[1] All values represent complete unification among the American, British, and Canadian standards for Unified threads with the exception of those in light face type. The latter will appear in the American publications but do not constitute a part of the Unified system.
[2] Based on the average of the mean minor and pitch diameters of the external thread.

Technical Basis of Accord

The three principal characteristics of screw threads are angle and form of thread, pitch (the combinations of diameter and number of threads per inch for the various thread series), and limiting dimensions (the manufacturing tolerances and allowances) for each grade of thread fit.

The British system, originated by Whitworth in 1845, is based on a thread angle of 55 degrees with a thread form having rounded crests and roots. The American system, developed by Sellers in 1864, has a thread angle of 60 degrees with a thread form having flat crests and roots. The number of threads per inch for the various series of thread diameters was the same in both systems, with the exception of the half-inch coarse thread. Accurate fits between components having different thread angles were impossible. Moreover, the tolerances and allowances varied in the two systems.

The present unification agreement provides a 60-degree angle and a rounded root for screw threads. The crest of the external thread may be flat, as preferred in American practice, or rounded, as preferred by the British. The number of threads per inch for the various series of thread diameters has been unified, and the limiting dimensions for three grades of fit have been agreed upon. Thus, interchangeability of screw thread parts, based on the accord, now becomes feasible.

The Tables

The sizes agreed upon, the threads per inch, and the basic dimensions of the unified coarse and fine thread series are presented in Tables 1 and 2. These and other tables, together with the agreements that (1) the minimum internal thread shall be basic and the allowances (or minimum clearances on the flanks of the threads) shall be applied to the external threads and (2) tolerances shall be in the minus direction on the external thread and plus direction on the internal, assure interchangeability of threaded products. Threaded parts of standard diameters and threads per inch, made in accordance with these principles, will always assemble freely.

There is, however, a further degree of interchangeability attained by agreements on the numerical values for allowances and tolerances, thereby setting limits to the least and greatest amounts of looseness between mating parts. Such agreement provides for identity of sizes (or interchangeability of use) of screw thread gauges used in the different countries for controlling the limits of size of the threads. It also standardizes the grade or grades of fits between mating parts.

Tables 3 and 4 are examples of such standardized limits of size. The particular limits of size for pitch diameters given in these tables, designated class 2A for external threads and 2B for internal threads, constitute the second or medium grade of three standard grades of fit. The additional classes are designated 1A and 1B, and 3A and 3B. Classes 2A and 2B are those which, in the course of their development by industry during the past few years, became rather widely known by the class designations A and B. Class 2A is the recognized standard in the United States for bolts, and screws, while class 2B is for nuts. These classes are also suitable for a wide variety of other applications.

The Basic Formula

The basic formula, from which allowances on all diameters and tolerances on pitch diameter are derived is:

Tolerance (or allowance) =

$$C\left(0.0015\sqrt[3]{D} + 0.0015\sqrt{L_e} + 0.015\sqrt[1.5]{p}\right)$$

In this formula C is a factor which differs for each allowance or tolerance for each class, D is the basic major diameter, L_e is the length of engagement, and p is the pitch. The formula is based on the accuracy of present day threading practice, and is applicable to all reasonable combinations of diameter, pitch, and length of engagement.

The values of the factor C for allowances are as follows:

Class	Factor C
1A	0.450 or 0.300
2A	0.300
3A	0.000

The values of the factor C for pitch diameter tolerances are as follows:

Class	Factor C
1A	1.500
1B	1.950
2A	1.000
2B	1.300
3A	0.750
3B	0.975

The relative difficulties of manufacture were provided for by making the value of the factor C 30 percent greater for internal than for external threads of a given grade of fit.

Important Sub-committee

As suggested in the above discussion and indicated in the footnotes to the tables, a few details remain to be agreed upon. An editing subcommittee, consisting of representatives of the three nations, was appointed by the Sectional Committee B1 on the Standardization and Unification of Screw Threads at its meeting on November 18, 1948. This subcommittee was authorized to resolve, within specified limitations, the differences which remain. Any agreements reached will be incorporated in the American standard without further formal action by the three Governments.

Future Developments

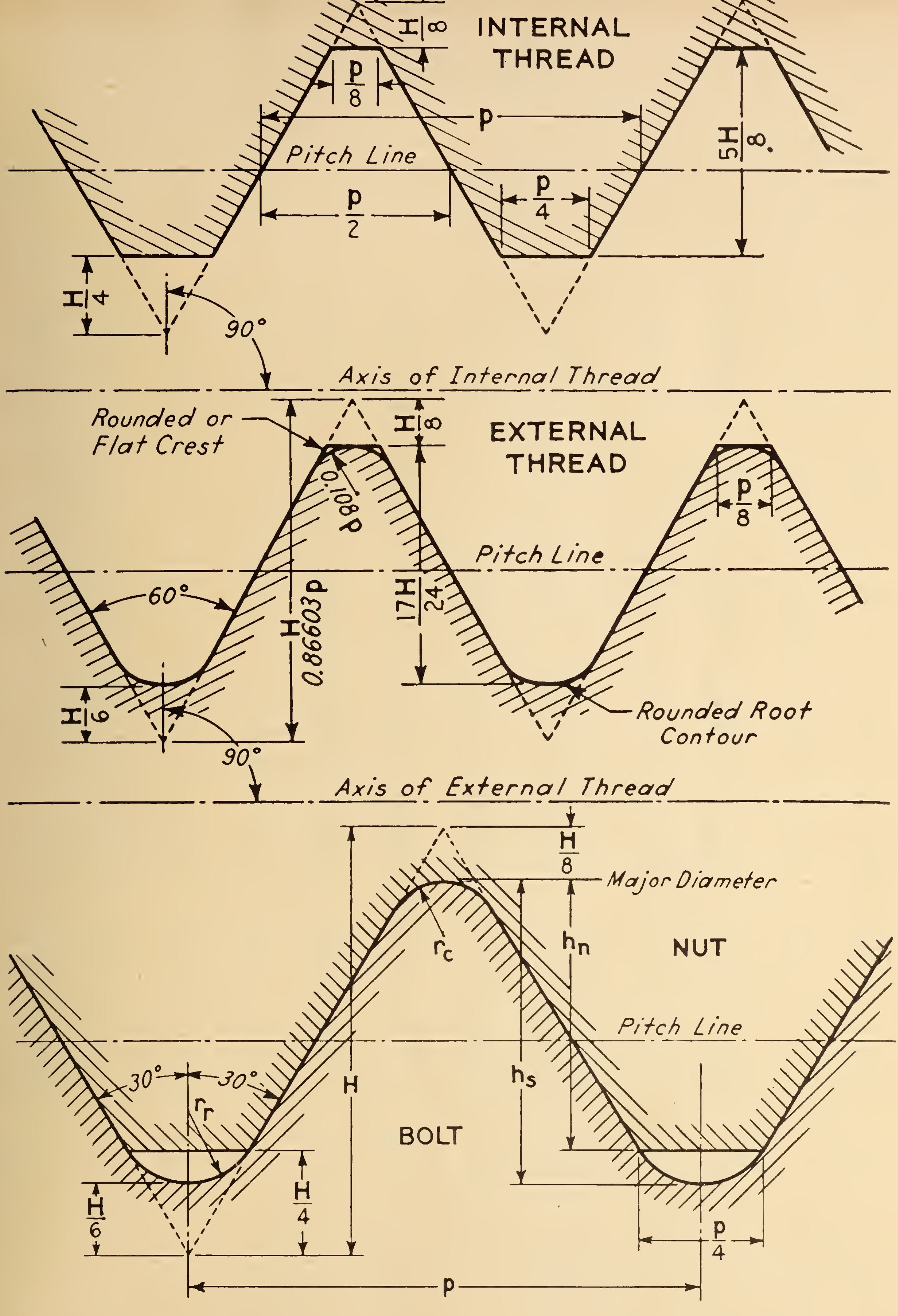
In one sense, the present accord marks the culmination of thirty years of work by the three nations toward the establishment of unification. In another sense, the accord marks the beginning of the realization of the unification. Purchases by the three governments will be based on the new standards, but industrial use within the normal commerce of each of the nations will require a transformation of industrial practices, involving considerations of engineering, design, tooling, and production. Such a change will take time, but the transition should be completed in the next few years.

At the same time, continued screw thread research is important. A screw thread is one of the more complex regular geometrical forms. There are so many variables which enter into the design of a satisfactory threaded fastener that most of the knowledge applied in such design has been empirical rather than theoretical. An immediate result of the Ottawa Conference in 1945 was the establishment of the programme of research to be carried out by the National Bureau of Standards of the United States, the National Physical Laboratory of England, and the National Research Council of Canada.

Cooperation Essential

The present accord calls for a continuance of future cooperation in the field of screw thread standardization. Such cooperation has two aspects: first, the extension of the unification to the other English-speaking nations (all of which use the English system of measurement in manufacture) and, second, the continued development of standards. For standards are not static, and they must keep pace with improvements in materials and methods of production and inspection developed in industry. The reduction of the varieties of fasteners is one of the possibilities which further studies of standards and simplification may yield.

Moreover, the present accord pertains to the most commonly used type of screw thread. Other important types of screw threads remain to be standardized. In the case of Acme and Buttress threads the unification of standards has reached an advanced stage. Further, standardization of drawing room practices within the countries and their unification among the countries are essential if there is to be an interchangeability of blueprints and production drawings. In these and related fields, the three governments and the respective standardization organizations are carrying on continuing programmes.



$H = 0.866025p \qquad \frac{H}{8} = 0.108253p \qquad \frac{H}{6} = 0.144338p \qquad \frac{H}{4} = 0.216506p$

$r_c = 0.108253p \qquad r_r = 0.144338p \qquad h_s = \frac{17H}{24} = 0.613434p \qquad h_n = \frac{5H}{8} = 0.541266p$

TABLE 3.—LIMITS OF SIZE, UNIFIED COARSE-THREAD SERIES, CLASS 2A EXTERNAL THREADS, CLASS 2B INTERNAL THREADS [1, 2]

Sizes	Threads per Inch	CLASS 2A SIZES					CLASS 2B SIZES				
		Major Diameter		Pitch Diameter		Minor Diameter Maximum[3]	Minor Diameter		Pitch Diameter		Major Diameter Minimum[4]
		Max.	Min.	Max.	Min.		Min.	Max.	Min.	Max.	
1	2	3	4	5	6	7	8	9	10	11	12
		Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
1 (.073)	64	0.0724	0.0686	0.0623	0.0603	0.0532	0.0561	0.0623	0.0629	0.0655	0.0730
2 (.086)	56	.0854	.0813	.0738	.0717	.0635	.0667	.0737	.0744	.0772	.0860
3 (.099)	48	.0983	.0938	.0848	.0825	.0727	.0764	.0841	.0855	.0885	.0990
4 (.112)	40	.1112	.1061	.0950	.0925	.0805	.0849	.0938	.0958	.0991	.1120
5 (.125)	40	.1242	.1191	.1080	.1054	.0935	.0979	.1062	.1088	.1121	.1250
6 (.138)	32	.1372	.1312	.1169	.1141	.0989	.1042	.1145	.1177	.1214	.1380
8 (.164)	32	.1631	.1571	.1428	.1399	.1248	.1302	.1384	.1437	.1475	.1640
10 (.190)	24	.1890	.1818	.1619	.1586	.1379	.1449	.1559	.1629	.1672	.1900
12 (.216)	24	.2150	.2078	.1879	.1845	.1639	.1709	.1801	.1889	.1933	.2160
¼	20	.2489	.2408	.2164	.2127	.1876	.1959	.2060	.2175	.2223	.2500
5/16	18	.3113	.3026	.2752	.2712	.2431	.2524	.2630	.2764	.2817	.3125
⅜	16	.3737	.3643	.3331	.3287	.2970	.3073	.3184	.3344	.3401	.3750
7/16	14	.4361	.4258	.3897	.3850	.3485	.3602	.3721	.3911	.3972	.4375
½	13	.4985	.4876	.4485	.4435	.4041	.4167	.4290	.4500	.4565	.5000
½	12	.4985	.4871	.4444	.4393	.3963	.4098	.4225	.4459	.4525	.5000
9/16	12	.5609	.5495	.5068	.5016	.4587	.4723	.4850	.5084	.5152	.5625
⅝	11	.6234	.6113	.5644	.5589	.5119	.5266	.5397	.5660	.5732	.6250
¾	10	.7482	.7353	.6832	.6773	.6255	.6417	.6553	.6850	.6927	.7500
⅞	9	.8731	.8592	.8009	.7946	.7368	.7547	.7689	.8028	.8110	.8750
1	8	.9980	.9830	.9168	.9100	.8446	.8647	.8795	.9188	.9276	1.0000
1⅛	7	1.1228	1.1064	1.0300	1.0228	.9475	.9704	.9858	1.0322	1.0416	1.1250
1¼	7	1.2478	1.2314	1.1550	1.1476	1.0725	1.0954	1.1108	1.1572	1.1668	1.2500
1⅜	6	1.3726	1.3544	1.2643	1.2563	1.1681	1.1946	1.2126	1.2667	1.2771	1.3750
1½	6	1.4976	1.4794	1.3893	1.3812	1.2931	1.3196	1.3376	1.3917	1.4022	1.5000
1¾	5	1.7473	1.7268	1.6174	1.6085	1.5019	1.5335	1.5551	1.6201	1.6317	1.7500
2	4½	1.9971	1.9751	1.8528	1.8433	1.7245	1.7594	1.7835	1.8557	1.8681	2.0000
2¼	4½	2.2471	2.2251	2.1028	2.0931	1.9745	2.0094	2.0335	2.1057	2.1183	2.2500
2½	4	2.4969	2.4731	2.3345	2.3241	2.1902	2.2294	2.2564	2.3376	2.3511	2.5000
2¾	4	2.7468	2.7230	2.5844	2.5739	2.4401	2.4794	2.5064	2.5876	2.6013	2.7500
3	4	2.9968	2.9730	2.8344	2.8237	2.6901	2.7294	2.7564	2.8376	2.8515	3.0000
3¼	4	3.2467	3.2229	3.0843	3.0734	2.9400	2.9794	3.0064	3.0876	3.1017	3.2500
3½	4	3.4967	3.4729	3.3343	3.3233	3.1900	3.2294	3.2564	3.3376	3.3519	3.5000
3¾	4	3.7466	3.7228	3.5842	3.5730	3.4399	3.4794	3.5064	3.5876	3.6021	3.7500
4	4	3.9966	3.9728	3.8342	3.8229	3.6899	3.7294	3.7564	3.8376	3.8523	4.0000

[1] All values represent complete unification among the American, British and Canadian standards for Unified threads with the exception of those in light face type. The latter will appear in the American publications but do not constitute a part of the Unified system. However, it is expected that ultimate agreement on certain of these values will be attained.

[2] The values in these tables are based on a length of engagement equal to the nominal diameter.

[3] The minimum minor diameter of the external thread may be determined by subtracting 0.6495p ($=h_b$) from the minimum pitch diameter of the external thread. This minimum diameter is not controlled by gauges but by the form of the threading tools.

[4] The maximum major diameter of the internal thread may be determined by adding 0.7939p ($=1\ 2/9 \times h_b$) to the maximum pitch diameter of the internal thread. This maximum diameter is not controlled by gauges but by the form of the threading tools.

TABLE 4.—LIMITS OF SIZE, UNIFIED FINE-THREAD SERIES, CLASS 2A EXTERNAL THREADS, CLASS 2B INTERNAL THREADS [1,2]

Sizes	Threads per Inch	CLASS 2A SIZES					CLASS 2B SIZES				
		Major Diameter		Pitch Diameter		Minor Diameter Maximum[3]	Minor Diameter		Pitch Diameter		Major Diameter Minimum[4]
		Max.	Min.	Max.	Min.		Min.	Max.	Min.	Max.	
1	2	3	4	5	6	7	8	9	10	11	12
		Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
0 (.060)	80	0.0595	0.0563	0.0514	0.0496	0.0442	0.0465	0.0514	0.0519	0.0542	0.0600
1 (.073)	72	.0724	.0689	.0634	.0615	.0554	.0580	.0634	.0640	.0665	.0730
2 (.086)	64	.0854	.0816	.0753	.0733	.0662	.0691	.0746	.0759	.0786	.0860
3 (.099)	56	.0983	.0942	.0867	.0845	.0746	.0797	.0856	.0874	.0902	.0990
4 (.112)	48	.1113	.1068	.0978	.0954	.0857	.0894	.0960	.0985	.1016	.1120
5 (.125)	44	.1243	.1195	.1095	.1070	.0964	.1004	.1068	.1102	.1134	.1250
6 (.138)	40	.1372	.1321	.1210	.1184	.1065	.1109	.1179	.1218	.1252	.1380
8 (.164)	36	.1632	.1577	.1452	.1424	.1291	.1339	.1402	.1460	.1496	.1640
10 (.190)	32	.1891	.1831	.1688	.1658	.1508	.1562	.1624	.1697	.1736	.1900
12 (.216)	28	.2150	.2085	.1918	.1886	.1712	.1773	.1835	.1928	.1970	.2160
¼	28	.2490	.2425	.2258	.2225	.2052	.2113	.2173	.2268	.2311	.2500
5/16	24	.3114	.3042	.2843	.2806	.2603	.2674	.2739	.2854	.2902	.3125
⅜	24	.3739	.3667	.3468	.3430	.3228	.3299	.3364	.3479	.3528	.3750
7/16	20	.4362	.4281	.4037	.3995	.3749	.3834	.3906	.4050	.4104	.4375
½	20	.4987	.4906	.4662	.4619	.4374	.4459	.4531	.4675	.4731	.5000
9/16	18	.5611	.5524	.5250	.5205	.4929	.5024	.5100	.5264	.5323	.5625
⅝	18	.6236	.6149	.5875	.5828	.5554	.5649	.5725	.5889	.5949	.6250
¾	16	.7485	.7391	.7079	.7029	.6718	.6823	.6903	.7094	.7159	.7500
⅞	14	.8734	.8631	.8270	.8216	.7858	.7977	.8062	.8286	.8356	.8750
1	12	.9982	.9868	.9441	.9382	.8960	.9098	.9188	.9459	.9535	1.0000
1⅛	12	1.1232	1.1118	1.0691	1.0631	1.0210	1.0348	1.0438	1.0709	1.0787	1.1250
1¼	12	1.2482	1.2368	1.1941	1.1879	1.1460	1.1598	1.1688	1.1959	1.2039	1.2500
1⅜	12	1.3731	1.3617	1.3190	1.3128	1.2709	1.2848	1.2938	1.3209	1.3290	1.3750
1½	12	1.4981	1.4867	1.4440	1.4376	1.3959	1.4098	1.4188	1.4459	1.4542	1.5000

[1] All values represent complete unification among the American, British, and Canadian standards for Unified threads with the exception of those in light face type. The latter will appear in the American publications but do not constitute a part of the Unified system. However, it is expected that ultimate agreement on certain of these values will be attained.

[2] The values in these tables are based on a length of engagement equal to the nominal diameter.

[3] The minimum minor diameter of the external thread may be determined by subtracting 0.6495p ($=h_b$) from the minimum pitch diameter of the external thread. This minimum diameter is not controlled by gauges but by the form of the threading tools.

[4] The maximum major diameter of the internal thread may be determined by adding 0.7939p ($=1\ 2/9 \times h_b$) to the maximum pitch diameter of the internal thread. This maximum diameter is not controlled by gauges but by the form of the threading tools.

Two Bridges at Three Rivers

by

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Part I—General Description of the Project

Some months ago Mr. O. Desjardins, chief engineer of Public Works, Province of Quebec, submitted a paper for publication in the *Journal*, dealing with these bridges. Before space permitted publication however, a second paper was forwarded by Mr. P. G. A. Brault, structural engineer, Dominion Bridge Company, dealing more particularly with their design and erection. The publications committee has therefore decided to publish both of these as a joint paper by both authors. Part I covers the historical aspects, tells why new structures were needed, why the present location and types were selected, and gives a description of the substructures. Part II deals with the design and erection of the steel work for the superstructures.

Continuing its programme of construction, the Provincial Department of Public Works of Quebec completed construction in the fall of 1947, on the bridges crossing over the outlet of the St. Maurice river, between Trois-Rivières and Cap de la Madeleine. These bridges are on main highway No. 2, about midway between Montreal and Quebec.

Both of the bridges are built with continuous plate girders, one measuring 1380 ft., the other 640 ft., separated by a roadway fill of 866 ft. over St. Christophe Island. The whole project from end to end extends over a distance of eight tenths of a mile. Each bridge has a 42-ft. roadway, with two 5-ft. sidewalks, the loading capacity corresponding to 20 tons. The estimated cost of the entire crossing is about $3 millions.

The West bridge has six 180-ft. main spans and two 150-ft. flanking spans, while the East bridge has three 140-ft. main spans and two 110-ft. end spans. The bridges and the connecting fill are one continuous tangent. Smooth curves at either end connect with existing streets. The bridges span navigable waters, and sufficient vertical clearance has been provided for water traffic. At low water level, the vertical clearance for navigation is about 41 ft. at the West bridge and 23 ft. at the East bridge.

The superstructure of both bridges is of all-welded construction, and is believed to be the greatest undertaking (2020 ft.) of this type not only in the Province of Quebec but throughout Canada, with the longest spans (180 ft. in the West bridge) yet attempted with welding.

Existing Bridges

These structures replace obsolete bridges which were too weak and narrow to suit present-day traffic. These original bridges were built in 1900, and were then suitable for relatively light traffic. Many years later, they were reinforced so as to be fit to carry a tramway system, but this project was afterwards abandoned on account of increasing traffic requirements, due to modern developments in road transportation.

These bridges serve not only Trois-Rivières and Cap de la Madeleine, but also a large area of the Lower St. Maurice Valley around Shawinigan Falls and Grand'Mère, as well as carrying all the traffic passing this point over the Montreal-Quebec Highway. Traffic, which is extremely heavy, is maintained day and night the year round, and the original 25-ft. roadway was quite inadequate; furthermore, the original bridges were designed only for a 10 ton load capacity, while the actual road loading is nearer 20 tons. There is no other bridge in the vicinity to accommodate such traffic, the nearest being twenty miles upstream.

Alternative Locations for New Bridges

Two locations were considered for the new bridges. Alternative "A" followed about the same alignment as the existing bridges. Alternative " B " was a new alignment close to the old bridges.

Selection of Type

Location " B " was the most favourable in all respects, as well as economical and was therefore chosen, but an arch bridge and continuous plate girders for the West bridge were compared, as the vertical clearance was greater than that at the East bridge. For the East bridge it was agreed that continuous plate girders were preferable, while two main girders or arched ribs proved more satisfactory than four girders or arched ribs. Furthermore, the two main girder system was $100,000 cheaper than the arched rib system. In the substructure of the arch design, the piers and abutments were bigger and would have cost some $200,000 more. Continuous plate girders were therefore chosen for the West bridge.

Even before the preliminary designs were made, the surrounding land was surveyed and information obtained as to river conditions and requirements of navigation. The street pavement on the Trois-Rivières or west side was 20 feet higher than that on the Cap de la Madeleine or east side. At normal stage, the depth of water was 23 feet for the West bridge and 15 feet for the East bridge. The fluctuation between high and low waters was 13 feet. In investigating the soil foundation, borings disclosed a layer of fine sand and clay underlying.

To arrive at convenient span lengths for each bridge, estimates were made of the main spans varying from 140 to 180 feet for the West bridge and from 120 to 150

Fig. 2.

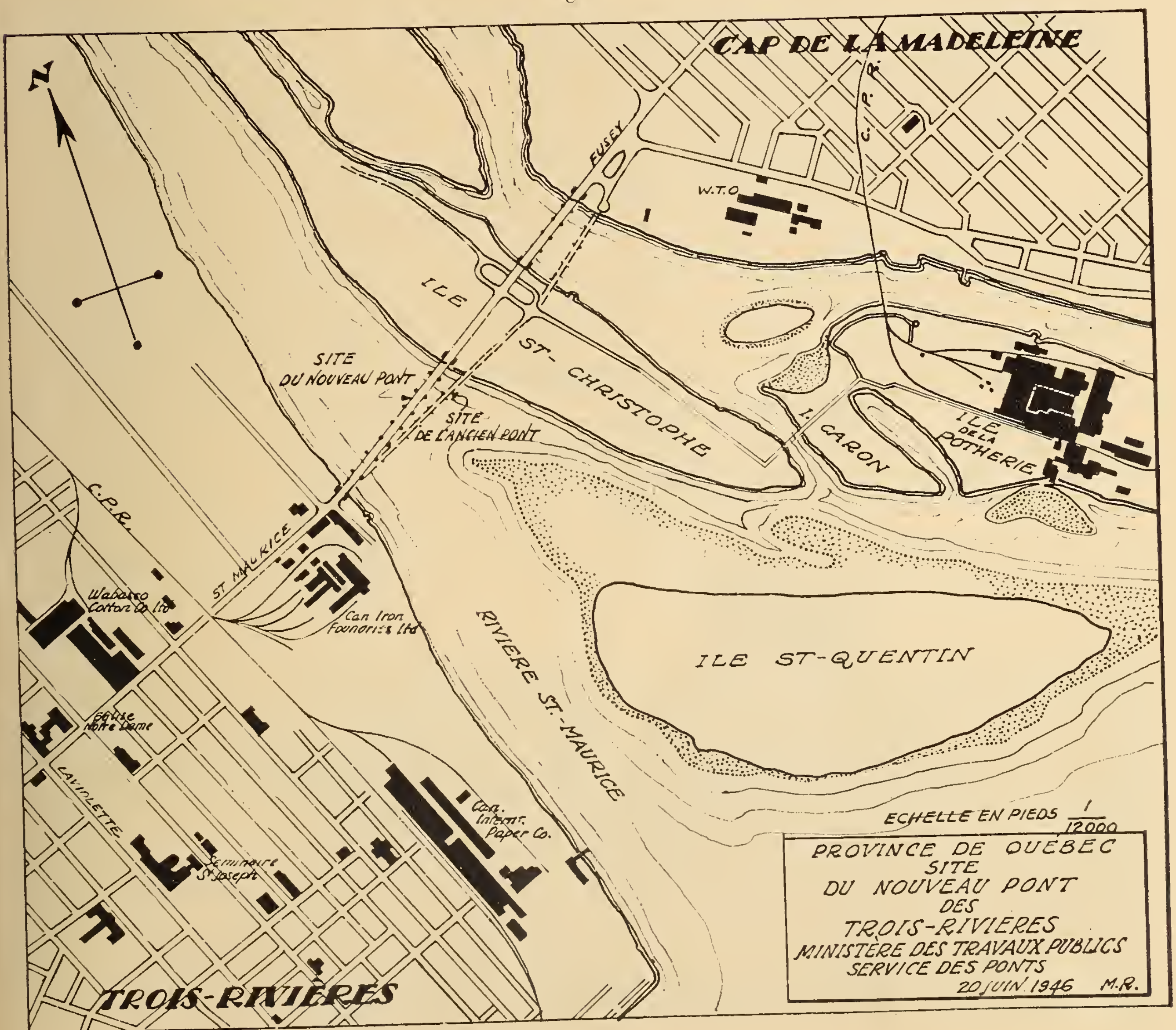
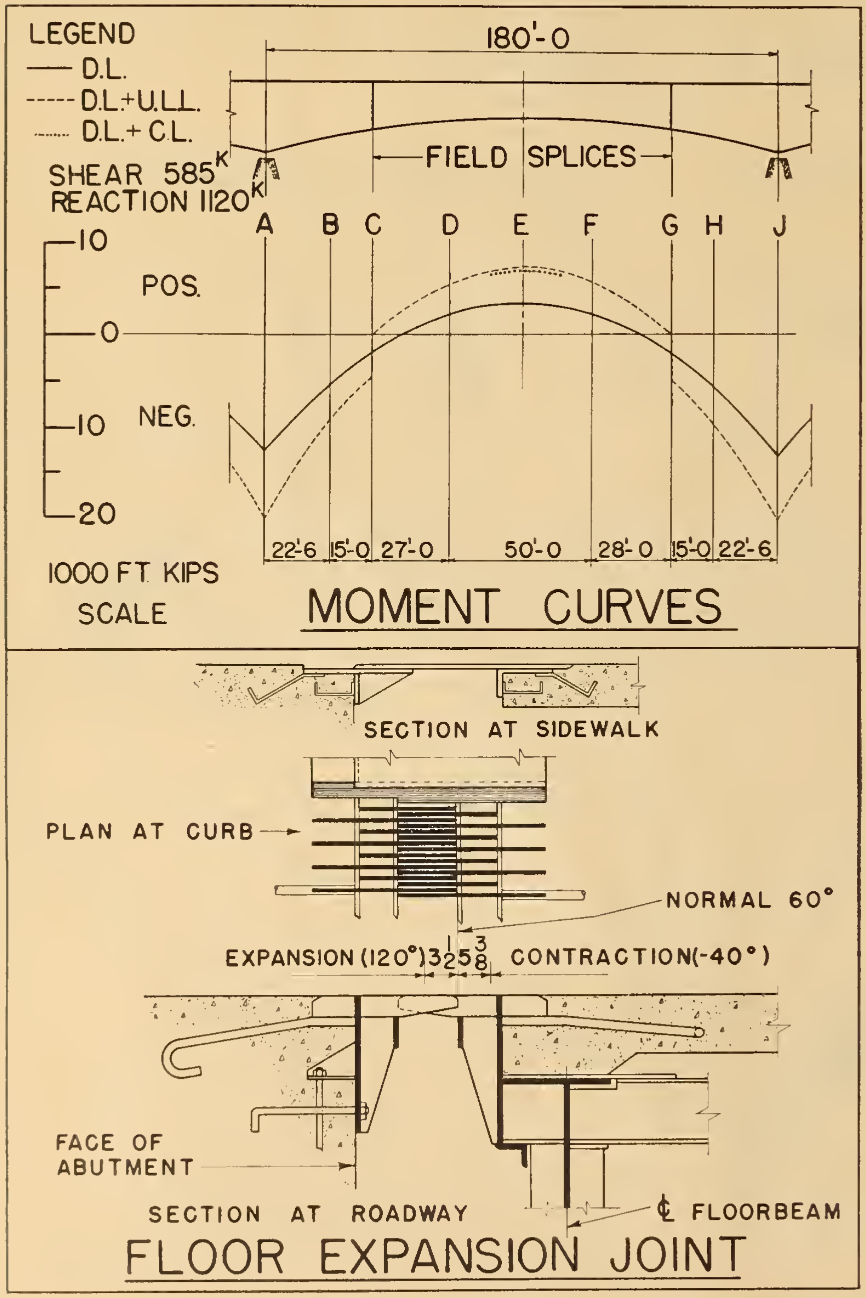


Fig. 3 (left). View showing piers of west bridge. Old structure in background.

Fig. 4 (right). View of south side of east bridge from St. Christophe Island, showing the piers. October 1947.

Fig. 5 and Fig. 6 (below) illustrate moment curves and floor expansion joint.



feet for the East bridge. The purpose of this was to balance the probable cost of the superstructure against the substructure. In multiple span bridges, these costs should balance. The estimated cost of a pier must as nearly as possible equal the cost of one adjacent span.

Pier Design

After establishing the profile of the roadway, the span lengths, and the depth of the steel superstructure at the piers, the height of each pier and abutment was next determined, taking into account the profile of the river bed. Of the four piers of the East bridge, the two shore ones were 24 feet high and the two main ones 27 feet. At the West bridge, the seven piers varied in height from 40 to 56 feet, with reinforced concrete bents for the upper part of the latter between the support of the steel superstructure to some four feet above high water level. Piers were designed to withstand the dead and live loads thereon, wind pressure on piers and superstructure, forces due to stream current with floating ice and drift, and longitudinal forces at the anchor piers of each bridge.

The length of the piers at the top was established as 32 ft. center to center by economical spacing of the main girders, and sufficient space for pier members was provided. The width of the piers at the top is 5 ft. on the East channel bridge and 6 ft. on the West channel bridge. With the type of superstructure adopted, considerable saving is made in the relatively reduced dimensions of the piers as compared to a superstructure consisting of simple spans, the superstructure being supported only on a pair of pier members instead of two pairs in simple spans.

All piers were provided with ogival cutting edges at each end and steel protection plates upstream, and were designed with a tremie concrete footing.

Abutments

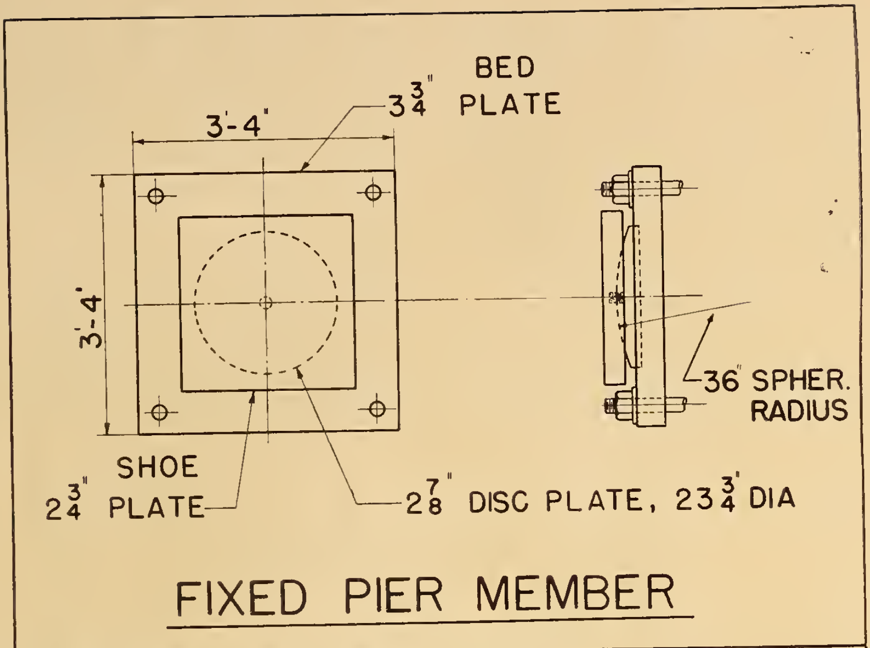
On account of their height, the soft clay foundation, and general appearance, reinforced concrete "U" abutments were designed with a slab on top between the wing-walls, similar to an inverted box. The roadway slab is supported on longitudinal reinforced concrete beams from the ballast wall to a reinforced concrete girder joining the top end of the wing-walls. Vertical walls carry the flooring of the roadway to the footing to which the piles are anchored. Concrete pilasters take the reaction of the superstructure and resist also any possible earth pressure. The rear end between wing-walls is left open to receive the gravel fill of the approaches. Each abutment was built monolithic to act as a unit against the thrust of the fill at the back. Weep holes were provided for the purpose of drainage and also of possible condensation.

Viaduct

To alleviate congestion of traffic on the approach between the two bridges at the road intersection a reinforced concrete underpass viaduct was provided, consisting of a rigid-frame type with cantilever wing-walls. For additional security the end of each wall rests on a column founded on a reinforced-concrete pile.

Appearance and Decoration

An ornamental balustrade was provided to improve the general appearance. Cedar hedges will also be planted along the outside edge



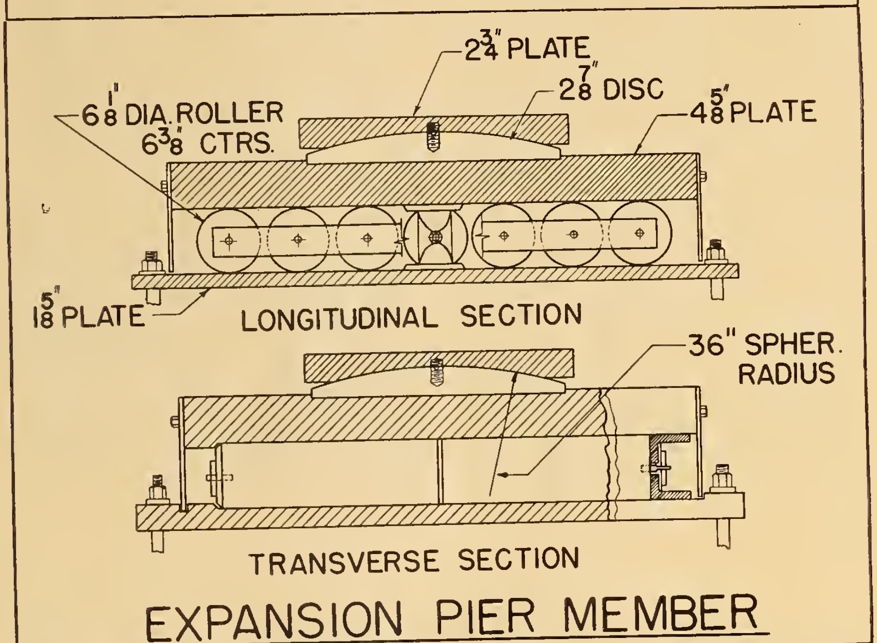
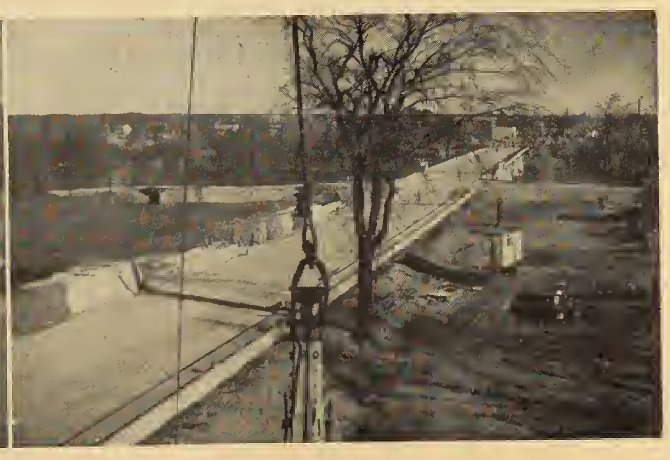


Fig. 7 and Fig. 8 (above) illustrate fixed pier member and expansion pier member.

Fig. 9 (below, left). West bridge—Trois Rivières.

Fig. 10 (right). East bridge and St. Christophe Island.



of the sidewalks of the approaches and on the Island fill, while eight dressed masonry pylons are to be erected, two at each end of each bridge; those on the St. Christophe Island will be small, while those at the east and west extremities will be 30 ft. high. A plate located to the right of the end pylons will bear the name of the bridges.

Acknowledgments

This crossing with its bridges was built by the Department of Public Works of the Province of Quebec, under the direction of the Hon. Romeo Lorrain, minister, and Mr. Ivan E. Vallee, deputy minister, acting also as consulting engineer. The design was prepared by the engineering staff of the Department. During construction, Mr. J. M. Reid served as resident engineer.

Construction was carried out by the Dufresne Engineering Company Ltd., of Montreal, acting as agents for the government. The steel superstructure of each bridge was manufactured and erected by the Dominion Bridge Company, Ltd., Lachine, P.Q.

Part II—Design and Erection

The East and West channel crossings of the Three Rivers Highway Bridge are of the all welded continuous girder type of construction. Structurally, they are the acme of simplicity and consist merely of a longitudinally reinforced concrete slab carried on crossbeams at 10 ft. centres which in turn are supported by two continuous girders at 32 ft. centres.

The continuous girders of the West crossing have two end spans of 148 ft. and six intermediate spans of 180 ft. The East crossing has two end spans of 108 ft. and three intermediate spans of 140 ft. The crossings are symmetrical about their straight longitudinal centreline, and provide for a 42 ft. roadway between 9 in. high curbs, as well as a 5 ft. clear sidewalk from curb to steel fence on either side.

The reinforced concrete roadway slab is of a uniform thickness of 8 in., and forms a 3 in. parabolic crown between curbs. The roadway crown is located 12 in. above the crossbeams or main girders which are flush top. The slab is brought to bear on the girder and crossbeam flanges by increasing its thickness at the rate of 2¼ in. in 12 in. from either side of the flange edges.

Design

The steel superstructure is designed to the Canadian Standards Association specifications for steel highway bridges (S6-1938), supplemented by the Province of Quebec general specification for highway bridges (1943).

The allowable tensile stress is 20,000 p.s.i. and the permissible flexural compression is governed by the formula "23,000-300 L/B" with a maximum of 20,000 p.s.i. Allowable web shear is 12,500 p.s.i. All welding is governed by the Canadian Standards Association specification for metallic electric arc welding (W59-1946). This specification permits a unit stress of 20,000 p.s.i. for weldments in compression, and 13,600 p.s.i. for weldments in shear. For welds in tension the allowable unit stress is 85 per cent of normal or 17,000 p.s.i.

On the roadway, the maximum stress produced by either a uniform live load or a concentrated live load is required to be determined. The roadway uniform live load is specified as 100 p.s.f. to the crossbeams, 70 p.s.f. to the main girders of the west crossing and 80 p.s.f. to the main girders of the east crossing. For all uniform loads full span loading only is considered. Adjacent or alternative spans are loaded as necessary to produce maximum stress. The alternative roadway concentrated live load is specified as one 20 ton truck with 30 per cent impact per 9 ft. lane.

Fig. 11. Downstream side view—finished east crossing—looking east.

Only one such series of trucks abreast is considered per crossing. A stationary lateral wind force of 50 p.s.f. on 1½ times the projected area of the unloaded structure is also specified in the design.

Crossbeams

Since the crossbeams and main girders are flush top, the crossbeams are actually in three parts. The cantilevered portions outside the main girders are referred to as floor brackets and that portion between the main girders is referred to as the floorbeam. The floorbrackets extend a total length of 10 ft. 6 in. beyond the main girders and support 5 ft. of the roadway surface as well as the sidewalk, facia, fence and utility conduits. Their shear at the main girder amounts to 18 kips for dead load, 5 kips for uniform live load and 21 kips for truck load and impact, or a total shear of 44 kips. The corresponding cantilever moments are 110 ft. kips for dead load, 38 ft. kips for uniform live load and 73 ft. kips for truck load and impact, that is 221 ft. kips total moment.

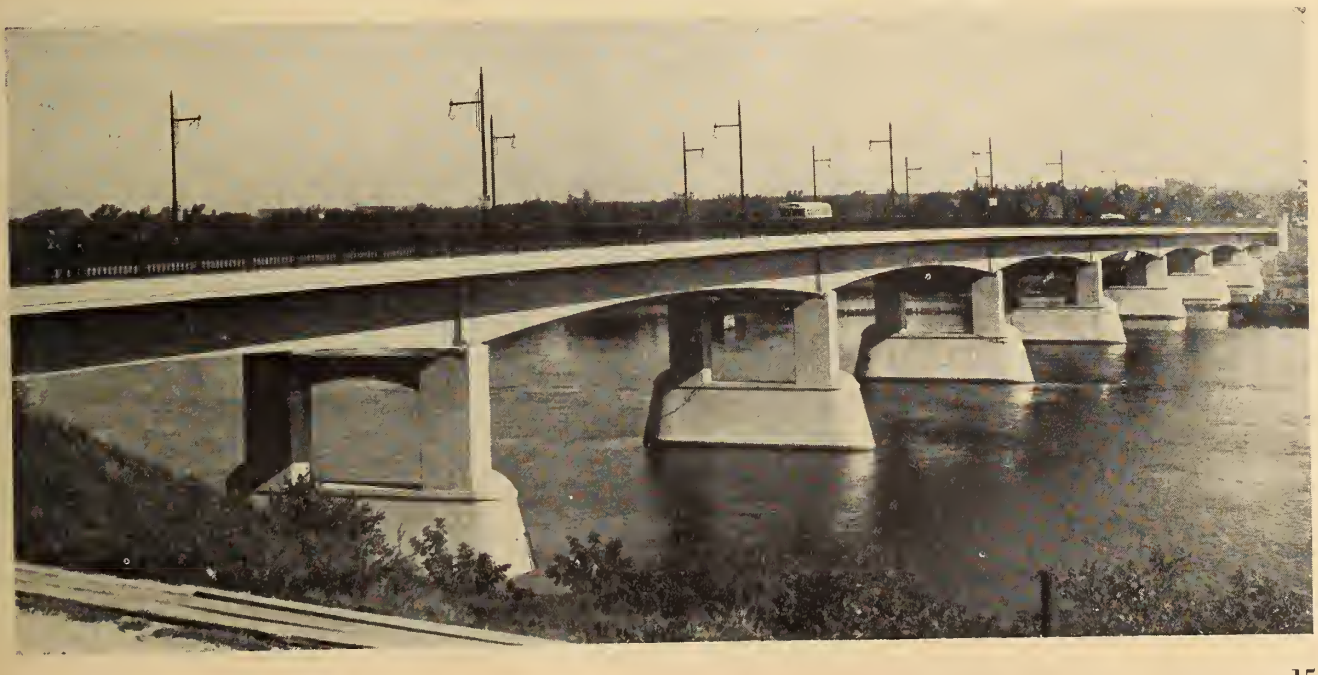
The floor-brackets are of all welded construction and consist of a ⅜ in. web plate with 12 in. by ½ in. top flange plate and 8 in. by ⅜ in. bottom flange plate. At the inner end the depth is made equal to the depth of the floorbeam or 33⅛ in. At the outer end the depth out to out of flange plate is 12 in., the bottom flange being straight and sloping throughout its length. At the main girder the web and bottom flange are milled, as are the ends of the floorbeams themselves, so that the compressive resistance to the cantilever moment is taken in bearing through the web of the main girder. The tensile resistance to the cantilever moment is obtained by carrying the top flange plate clear past the main girder and connecting to the top flange of the floorbeam. The web plate, being coped for a depth of 10 in. at the top to clear the main girder flange, does not contribute to the tensile resistance.

Since holes are required for field assembly, it was deemed economical to field rivet this connection rather than field weld. This rivetting is performed only after the field welding of the web is completed. At the outer edge of the floor bracket, a vertical 6 in. by ⅜ in. plate, welded to both web and flanges, has four rivet holes for connecting the 6 in. vertical leg of the facia shelf angle. The shelf angles are fabricated in two panel lengths and have 2 in. by ¼ in. plates 2 in. long welded on edge at 24 in. centres, placed ¾ in. from the toe of the 3½ in. horizontal leg. These plates serve to bond the lower edge of the concrete facia beam. The shelf angles also serve a particularly useful secondary purpose in facilitating the positioning and alignment of the outer ends of the floor brackets. For these reasons it is suggested that their use be maintained in all future designs of bridges of this type.

The floorbeams are designed as beams freely supported at the main girders and are proportioned for the maximum moment at their centreline. Full advantage is taken of the reduction of dead load moment due to the cantilevered floorbrackets, but for live load moment, no account is taken of any end restraining action which might be effected by such factors as the size of the main girder, knee braces, the action of adjacent floorbeams or the location of the floorbeam with respect to the piers. The bond of the concrete floorslab to the top flange is assumed to hold the floorbeam laterally, but the slab is not assumed to contribute to flexural resistance.

The centreline moment due to dead load, figured as a simple span, amounts to 160 ft. kips, which quantity is reduced by 91 ft. kips, the dead load moment of the floor bracket, giving a net dead load moment of 69 ft. kips. Only one half the weight of utility cables on the floor bracket is considered when computing the cantilever dead load moment reduction. Four trucks abreast produce a moment of 450 ft. kips and an impact of 135 ft. kips. The total design moment is therefore 654 ft. kips, which at 20,000 p.s.i. requires a section modulus of 393 in.^{3}. A 30 in. by 11½ in. wide-flange beam at 130 lbs. per ft. having a section modulus of 404.8 in.^{3} is provided.

Fig. 12. Downstream side view—finished west crossing—looking east.



The end shear totals 100 kips, made up of 20 kips due to dead load and the balance due to truck and impact loads.

The floorbeams are held rigidly against overturning during erection by connecting the top corners of their webs to small 5 in. by ⅜ in. plates, which are welded to both the web and top flange of each main girder. These small web connecting plates are so located that on one main girder contact is made with the nearside of the floorbeam web and on the other main girder with the far side, thus permitting the floorbeam to swing horizontally into place.

In way of the river piers, the floorbeams are replaced by relatively stiff frames which have the threefold function of acting as a floorbeam, as a jacking girder for dead load of steel during erection, and of transferring the specified lateral force to the pier members. No permanent wind bracing is supplied, as the floor slab is designed to transmit the lateral load to the pier frames. At piers with adjacent 180 ft. spans, this lateral force totals 166 kips and is assumed to be resisted equally by the two pier members. The frame is proportioned at 25 per cent increased unit stresses for the moment of this lateral force about the neutral axis of the frame added to the moment of the floorbracket.

On the west crossing a pier frame consists of a 60 in. deep welded plate girder, with triangular webs inserted at each end between its bottom flange and the bottom flange of the main girder. These triangular webs extend to points 3 ft. 6 in. from the centreline of the main girders. Between these points, the web is stiffened with pairs of 4 in. by 5/16 in. plates spaced at 50 in. centres. Horizontal stiffeners placed opposite the bottom flange of the floorbrackets are provided to resist the thrust from the cantilever moment.

The frame web is connected to the main girder by butt welding it full length to the edge of the central 1½ in. thick bearing stiffener. This connection is accomplished by shop welding the edge of 3 in. by ¼ in. flat for the full depth of the bearing stiffener. This flat then serves the dual purpose of acting as a backing bar for the butt weld and providing holes at 9 in. centres for field assembly. To permit swinging the frame transversely into place these connecting flats on opposing main girder bearing stiffeners are positioned so as to contact opposite sides of the frame web surface. The east crossing pier frame design is similar to that of the west crossing with the exception that the welded girder is 40 in. deep instead of 60 in. deep.

Main Girder Geometry

Special importance is given to the determination of the geometry of the main girders. These calculations are used not only for their design computations, but also for their detailing and fabrication. The geometry may be defined as the establishment of the out to out dimensions of flanges throughout the length of the girder. The outside of the top flange is made parallel to and a fixed distance of 12 in. below the defined longitudinal crown of roadway.

To determine the underside of the bottom flange it is necessary to establish the economical depth of girder, out to out of flanges, at the piers and at the centreline between piers. The time element does not permit complete redesigns with various depths in order to attain absolute economy. Full use is made of past experience in the design of many bridges of this type and depths are chosen and maintained throughout the computations.

The 180-ft. spans of the west crossing are made 12 ft. deep at the piers and 8 ft. deep midway between piers. The corresponding depth for the 140-ft. span of the east crossing are 10 ft. and 6 ft. 6 in. The bottom flange is kept truly horizontal for a distance of 1 ft. 6 in. each side of the centreline of pier, to accommodate bearing stiffeners and pier members. Between the ends of these horizontal distances, the bottom flange is made approximately parabolic in shape with origin at the centreline of span.

The actual girder geometry of each span is determined by computing offsets to the flanges above and below an arbitrary working line, chosen as a straight line joining points 3 ft. below the top flange at the centreline of piers. Offsets, called working perpendiculars, are figured at each crossbeam position, and are made perpendicular to the working line. All floorbeams, floorbrackets and related details between piers are kept normal to the working line and on the working perpendicular.

Main Girder Proportioning

Like all indeterminate structures, it is necessary to know the material of the main girder before a correct stress analysis of it can be made. This implies determining the material by an approxi-

Fig. 13. Deck view—small traveller.

mate method and with this material making successive corrections using more exact methods. One of two approximate methods is generally adopted. The first is to assume a constant moment of inertia of the girder and to apply factors to the resulting moment at the supports and at midspan. For the 180 ft. span such factors would be about 1.25 at the pier and 0.75 at the centreline of span. The second approximate method is to assume a ratio of minimum I to maximum I of about 0.25, and to determine stiffness and carry-over factors from published tables of derived properties of haunched beams. Though these tables are intended for the use of concrete girders, the resulting moments obtained by distribution of fixed end moments are a reasonable first approximation.

The more exact successive steps consist of determining the moment of inertia of the girder at each floorbeam using depths defined by the geometry and material derived from the first approximation; determining the stiffness and carry-over factors due to variable moment of inertia; determining moments at the supports by distribution of fixed end moments; determining end shears; determining moments at each crossbeam position and at splice points; verifying the unit stress of the material at each point. If the material is found to be overstressed or understressed, it is corrected and the computations repeated.

In these calculations, the floor slab is not considered as contributing to the resistance of the vertical bending moment. For the 180-ft. span the resulting moments, shear and material due to a dead load of 4400 lb. per ft., a sidewalk uniform live load of 180 lb. per ft., a roadway uniform live load of 1,650 lb. per ft. or alternatively a concentrated load of 98,600 lb. followed by one of 24,600 lb., 14 ft. away due to four 20-ton trucks abreast with impact, are shown in the accompanying illustrations.

The maximum web shear of 585 kips requires a web area of 46.8 sq. in. A web plate 139 in. by ⅜ in. having an area of 52.1 sq. in. is provided, and is adequately stiffened by intermediate stiffeners at 5-ft. centres. The location of shop web splices is dictated by the size of plate available. These splices are full strength butt welds. Similarly the location of flange shop splices was dictated by lengths of plate obtainable in Canada. If it were possible, it would be more economical to avoid altogether the use of shop flange splices. Each position of flange shop weld must be analysed, to verify that the unit stress induced by the applied bending moment does not exceed 17,000 p.s.i., the allowable stress of weldments in tension. The field splice is located near a point of least bending moment, and is positioned midway between an intermediate web stiffener and a crossbeam. Thus the temporary bolted field connection does not interfere with the standard crossbeam arrangement and the bending moment is sufficiently low to permit taking out holes in the flanges for this connection without any increase in metal being required.

Main Girder Details

The girder web shears are resisted at the piers through the intermediary of welded plate stiffeners. These pier stiffeners are arranged in such a manner that the bearing stresses are transferred over a distributed area to the dished surface of the pier member. The group of bearing stiffeners is designed as a compression member at a maximum allowable unit stress of 15,500 p.s.i. For a reaction of 1,120,000 lb. an area of 72.3 sq. in. is required. Two central plates of 12 in. by 1½ in., plus four plates 7 in. by 1¼ in., spaced in pairs 8 in. either side of centre together with 20 in. of the ⅜ in. web plate provide 72.5 sq. in. of metal. Eighteen inches either side of the centreline of pier, where the bottom flanges change direction in forming the upward sweep of the parabolic curves, a small ½ in. plate fin is welded in to resist the outward component of the flange stress due to its direction change.

To improve the exterior appearance of the bridge, all intermediate main girder web stiffeners are placed on the interior face only. The sole stiffeners evidenced on the exterior web face are the main bearing stiffeners. Intermediate stiffeners are placed at each crossbeam position and also midway between crossbeams. At crossbeams, they are cut short and capped with a small plate to form a seat for the bottom flange of the floorbeam. The girder web for the depth of the floorbeam is stiffened by the direct welding of the web of the floorbeam and floorbracket. Stiffeners halfway between crossbeams run the full depth of the girder web between flanges. These intermediate stiffeners consist of single angles with toe welded to the girder web and outstanding leg parallel to the girder. Specifications do not cover the design of single angle stiffeners. However, the intent of the specification is considered as being complied with by designing the single angle stiffener with equivalent moment of inertia and section modulus to the corresponding conventional double angle stiffener that would be required. In computing the section modulus, a portion of the web (12 in.) is incorporated in the stiffener section.

Kneebraces are made of ⅜-in. plate fitted between the underside of floorbeams and the top face of the girder bottom flange. Their purpose is twofold. On the main girder pier section, they serve to stiffen the compression bottom flange, and they are located at each of the three crossbeams immediately on either side of the centreline of pier. On the main girder centre section, they are placed at every second crossbeam, and serve to transmit specified lateral loads to the resisting floor slab. Where used, the kneebraces replace the ordinary single angle intermediate stiffener.

For the full length of each continuous girder a ⅞-in.-dia. rod handgrip is located 3 ft. above the bottom flange. This grip is for the convenience and safety of department inspectors who may thus reach successive piers for inspection of pier members without climbing up and down at each pier.

Due to the fairly large downward grade of 1.5 per cent for most of the length of the west crossing, it is desirable to assure that no creeping of the floorslab might occur due to failure of bond with the top flange of the main girder. To this end, 1-in.-wide bars by ¾ in. deep and 12 in. long are welded to the top flange midway between each crossbeam. It is felt that these bars together with the floorbracket top flanges provide sufficient mechanical bond to prevent any possibility of relative slab movement.

The girders are cambered for

dead load only. The dead load deflection is computed and plotted graphically as a check and to determine the smoothness of the deflection curve. The camber is then added to that portion of the working perpendicular between the top flange and the working line, and subtracted from that portion of the working perpendicular between the working line and the bottom flange. Temporary erection bracing only is provided, and is removed after the floorslab has been poured. This bracing serves to square the structure during erection and to resist lateral forces during that period.

The effect of pier settlement on the continuous girders was investigated. Assuming a downward movement of 4 in. of a pier with 180-ft. spans on either side and no movement at adjacent pier, the reaction at the settled pier would reduce by 68 kips but the reaction at adjacent piers would increase by 52 kips. Thus at the settled pier the reaction is reduced by 6 per cent of maximum or 8.3 per cent of dead load only. Reactions at adjacent piers would increase by 4.6 per cent of maximum, or 6.3 per cent of dead load only. The effects on the bending moments would be to reduce the negative moment at the settled support by 3780 ft. kips, increase the positive moment midway in adjacent spans by 640 ft. kips and increase the negative moment at adjacent supports by 2430 ft. kips.

At midpoint of adjacent spans this means that the flange unit stress due to full dead load and live load would increase to 21,500 p.s.i. as compared with the design stress of 20,000 p.s.i. At the adjacent piers the flange unit stress due to dead load plus live load would increase to 22,100 p.s.i. For dead load only this stress would be 15,000 p.s.i. It would require a movement of 13 inches to attain a flange stress of 20,000 p.s.i. at adjacent piers, due to dead load only. Obviously, such a pier settlement would not endanger the structure, particularly as the live load could be controlled until corrective measures had been undertaken.

Pier Members

At each pier, the main girder reaction is transmitted to the concrete through a pier member, designed to distribute the load to the pier at a maximum pressure of 750 p.s.i. The main girder is considered fixed at the pier nearest the centre of each crossing. At this centre pier a non-moving or fixed pier member is used, and at all other bearings a roller nest or expansion pier member is employed.

A fixed pier member consists of a plate dished to a polished surface of 37 in. spherical radius which engages the polished surface of a disc plate of 36 in. spherical radius. The disc plate is welded to a thick bed plate designed to distribute the reaction over the required area. The dished plate is welded to the bottom flange of the main girder. Both the dished plate and disc plate have a threaded hole on dead centre. The hole in the dished plate is for a threaded dowel pin which engages the hole in the disc plate, thus assuring centering of the bearing. The hole in the discplate, prior to its use as just mentioned, serves to receive a temporary threaded eye-bolt, which permits ready handling of the pier member during its positioning. An expansion pier member is similar to a fixed pier member, with the exception that the bed plate is referred to as the upper bed plate, and rests on a series of rollers which in turn bear on a lower bed plate of nominal thickness.

All geometry calculations are based on a normal temperature of +60 deg. F. The maximum and minimum temperatures are assumed to be +120 deg. F and —40 deg. F, whence elongations are figured for a change of 60 deg. F and contractions for a change of 100 deg. F. In other words, the movement of the rollers from normal due to maximum increase of temperature is less than the movement due to maximum decrease of temperature. To equalize the movement of the rollers in both directions, the lower bed plates are offset from the centreline of pier by an amount equivalent to a temperature change of 20 deg. F. In this manner scribed lines on the centre of the upper and lower bed plates would be aligned at 40 deg. F; that is, the true average between assumed temperature extremes.

The west crossing expansion pier members at the abutments contain four 6⅛-in-dia. rollers 28⅛ in. long, and at all other piers they consist of seven rollers 42 in. long. On the east crossing they consist of three rollers 26¾ in. long at the abutments and five rollers 44¼ in. long at the remaining piers.

Floor Expansion Joint

At the abutments of both crossings, there is sufficient movement due to the defined temperature variations to necessitate the use of floor expansion joints. At the sidewalks, the conventional sliding checkered plate arrangement is used, but for the width of the roadway floor a finger type joint is adopted. The fingers are made of 2½ in. by ½ in. bars on edge, spaced at 1½-in. centres. They are chamfered at both ends and scalloped on the top edge to reduce skidding. Those on the abutment side alternate with those on the bridge side and have a normal overlap of 7½ in. and a clear space of ¼ in. between. They are supported by and welded to transverse vertical plates.

On the abutment side, these vertical plates are bolted to anchors preset in the concrete. On the bridge side, they are rivetted directly to short brackets provided on the pier frame. A series of longitudinal stringers are introduced in the first floor panel to resist the cantilever moment on the brackets. Nearby horizontal anchor rods with hooked ends are welded to the vertical plates just under the fingers.

Erection

The normal or preferred procedure for erecting a bridge of this type is to do all the assembly with a traveller on the deck of the structure. This method involves the use of temporary falsework bents placed at the outer end of the first girder section and at the outer end of each centre section. The reaction on the bent under this condition is very heavy, and for a successful operation it is necessary to be absolutely positive of its carrying capacity. Unfortunately, the decidedly soft river bed at the site precluded such assurance, thus eliminating any possibilty of using this falsework method of erection. Various other schemes were considered. The most promising was to erect the entire structure with floating derrick scows. This method was adopted and proved successful.

The site of the east bridge was not readily approachable by water from the St. Lawrence River, therefore all material was shipped by rail to a siding, where a locomotive crane transferred the steel to trucks and the material was transported to the job. A 20-ton guy derrick

(Continued on page 27)

Wartime Aeronautical Research & Development in Germany

by J. J. Green, M.E.I.C., F.R.Ae.S., *Air Transport Board, Ottawa*
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Part IV

The Walther Rocket Works at Kiel

The Walther Werke had originally commenced work on propulsive ducts for aircraft as early as 1936 and later extended the scope of its efforts to power units for submarines and torpedoes, employing the same principles as for aircraft propulsion. In the propulsive duct, which operates on the "Ramjet" or "Athodyd" principle, the forward speed of the duct results in compression of the air by "ramming". Heat is then added to the compressed air by the burning of fuel. (Fig. 43.)

The functioning of this system depends upon the forward speed, of course, to supply the necessary "ram" effect and therefore such a system cannot develop a static thrust when at rest. In an effort to overcome this difficulty the Walther Company were led to the use of rocket units to induce a flow through the propulsive duct under static conditions (Fig. 44). Subsequently, the rocket development overshadowed the propulsive duct project, due to its ability to provide extremely high thrusts for short periods, which had immediate application to assisting the take-off of heavily-loaded conventional aircraft.

Walther developed two classes of rockets known as "hot" and "cold" types, both of which employed "T-stoff" (an 80 per cent solution of hydrogen peroxide in water) as the basic fuel. Large quantities of heat and free oxygen were obtained from the decomposition of "T-stoff", which was accomplished by bringing it into contact with a catalyst, "Z-stoff", (an aqueous solution of sodium permanganate). The key to the Walther rocket developments lay in the ability to produce large quantities of pure hydrogen peroxide and to prepare it as a stable solution of exceedingly high concentration in water.

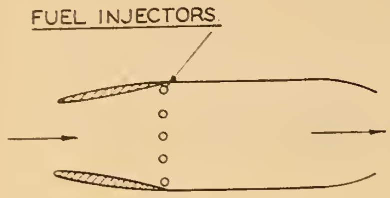
In the "cold" units, the gaseous steam and oxygen resulting from the decomposition of "T-stoff" provided the necessary jet action. In the "hot" units, the "T-stoff" acted as an oxidizing agent, additional fuel being supplied which burned with the free oxygen to produce both heat and additional gases. The second fuel

EDITOR'S NOTE

Late in 1945 a group of Canadian scientists and engineers visited Germany to investigate scientific and technological achievements of our former enemies. The authors of this paper, at that time on the staff of the National Research Council, were assigned to the field of aeronautics.

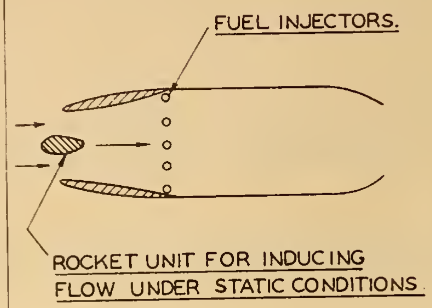
The report submitted by these scientists was long and comprehensive, but, in spite of heavy demands on their time, they have prepared a condensation specially for the JOURNAL: Even in this condensed form the report is of necessity being published in four instalments. When all four parts have been published it is hoped a consolidated reprint will be available for those interested in preserving the report in its entirety.

This fourth and last instalment covers the Walther Rocket Works at Kiel; the Focke-Wulf Structures Laboratory at Detwold; Blohm and Voss Aircraft Works at Hamburg; Bayerische Motoren Werke at Munich; Deutsche Versuchanstalt Outstations; Aerodynamics Institute at Sonthofen, a summary and conclusions are added.



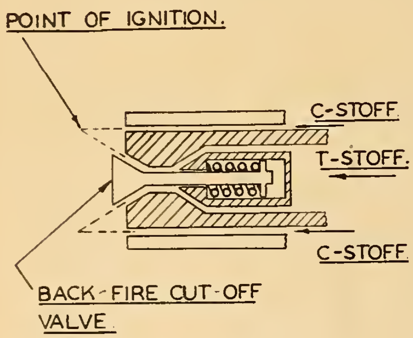
SIMPLE PROPULSIVE DUCT

FIG. 43



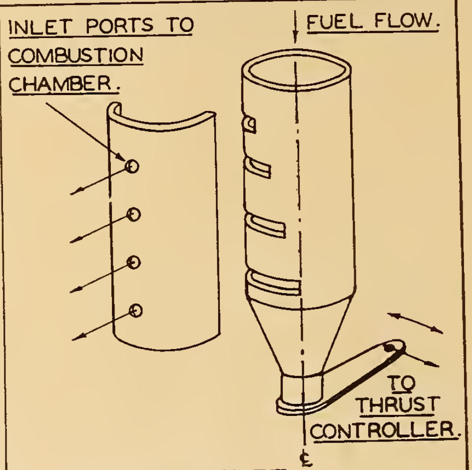
ROCKET BOOSTED PROPULSIVE DUCT.

FIG. 44



DUAL ROCKET SPRAY NOZZLE.

FIG 45



VARIABLE ROCKET INJECTION VALVE.

FIG. 46

employed was originally ordinary gasoline, but later "C-stoff", (a 30 per cent mixture of hydrazine hydrate in methyl alcohol) was preferred.

The "T-stoff" and "C-stoff" were injected into the combustion chamber by means of a special nozzle (Fig. 45), in which an internal diverging conical jet of "T-stoff" impinged upon an external cylindrical jet of "C-stoff". To prevent explosions it was necessary to pump the "C-stoff" first so that the "T-stoff" was decomposed immediately upon entry into the combustion chamber. A spring-loaded valve was provided in the "T-stoff" nozzle in case of back-fire.

In the smaller and simpler units the fuels were pumped by means of compressed air carried in bottles at 150 atmospheres pressure (2200 p.s.i.). In the larger, more advanced designs, electrically-driven centrifugal pumps were first used, but were later supplanted by turbine-driven pumps supplied with steam at 600 deg. C. resulting from the decomposition of "T-stoff" when passed over stone impregnated with "Z-stoff".

As corrosion protection is required with the above fuels, the tanks and piping had to be of either pure aluminum or stainless steel. Although jet temperatures were of the order of 1750 deg. C., the actual fuel nozzle temperatures were not high, so that stainless steel could be employed here also. In order to prevent the combustion chamber temperatures from becoming excessive, the "C-stoff" was led through a jacket surrounding the chamber walls before entering the combustion chamber, thus providing very effective cooling and permitting the use of low grade forged carbon steel for the combustion chamber.

Considerable difficulty was encountered at low temperatures since "Z-stoff" freezes at − 15 deg. C. while "T-stoff" itself freezes at − 25 deg. C. At high altitudes, above 40,000 ft., it was necessary to pressurize the fuel tanks and a small spiral pre-pump was used, in conjunction with the centrifugal impeller, to prevent cavitation.

On the simpler types of unit, metal rupture diaphragms were used as valves to initiate the flow. Usually, a powder squib was employed to actuate the piston and rupture a diaphragm in the air supply line, the line pressure then rupturing the diaphragms in the fuel lines. In the more advanced types, where control of the thrust was desired, a special injector valve in the combustion chamber, (Fig. 46), was developed which consisted of a rotating sleeve

Fig. 47. Walther 509 Rocket Power Plant for Messerschmitt Me 163 "Swallow" Fighter.

which progressively opens up additional fuel injection ports.

There were two main types of units used for assisting take-off. The first type had a " cold " drive and delivered 1100 lb. thrust for 30 seconds with a unit weight of 330 lb. and a fuel weight of 287 lb. giving a total of 617 lb. The second type employed a " hot " drive using gasoline as a second fuel and delivered 3300 lb. thrust for 30 seconds. The weight of this unit was 507 lb. plus 485 lb. of " T-stoff " and 24 litres of gasoline, giving a total of 1,030 lb. In order to prevent excessive temperatures in this unit, 30 per cent excess " T-stoff " was used to act as a coolant.

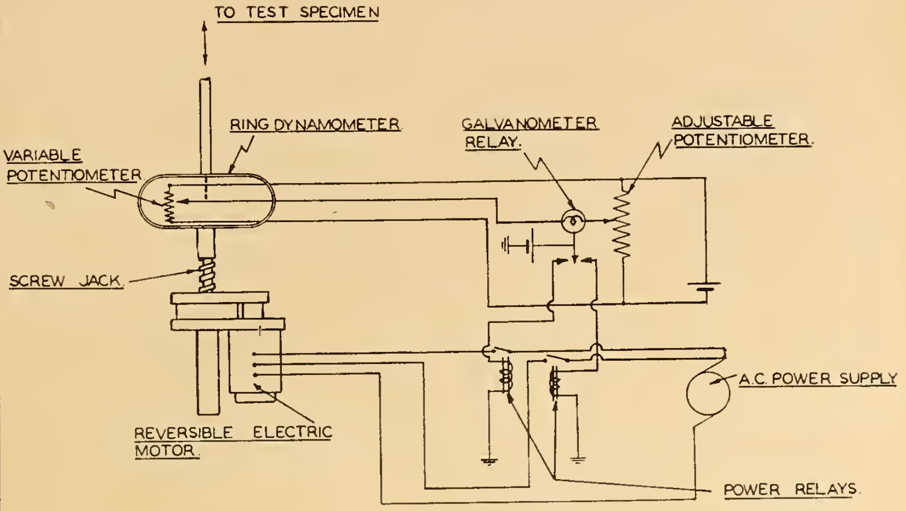
The large Walther 509 unit (Fig. 47), used "T-stoff" and "C-stoff" as fuels and was developed for continuous operation on the Messerschmitt 163 " Swallow " interceptor. The " Swallow " was a tailless rocket-propelled aircraft and with the Walther 509 unit delivering 3750 lb. thrust, the aircraft could attain a restricted maximum speed of 590 m.p.h. and required only three minutes to climb at an angle of 40 deg. to 33,000 feet. The gross weight of the aircraft was 9,000 lb., of which 4,400 lb. constituted fuel, but owing to the enormous fuel consumption of the rocket unit, the duration of flight was only 8 minutes, giving a range of approximately 66 miles when cruising at 495 m.p.h.

A modified 509 unit, delivering 4400 lb. thrust and weighing only 287 lb., was used for assisting take-off on the Messerschmitt 262 twin-jet fighter aircraft, the unit being mounted externally and jettisoned by parachute. Consideration had also been given to employing, in conjunction with the normal jet engine, a rocket unit burning " T-stoff " and kerosene for super-performance in an emergency. " T-stoff " had also been tried in piston type catapults used in V-1 launching, and a rocket-propelled catapult car had been developed for launching the Messerschmitt 163.

A further proposed development envisaged the use of a supplementary ceramic-lined combustion chamber, in conjuction with the normal rocket units, in order to develop high thrust for take-off and to give rapid acceleration through the trans-sonic region. The normal rocket unit was arranged to discharge into the large, jettisonable, auxiliary combustion chamber into which additional fuel was sprayed. In this way it was estimated that the thrust of the 509 unit used in the Me. 163 could be increased ten-fold which would permit the aircraft to be accelerated from rest to 1100 m.p.h. in only 6 seconds.

The Walther Company were developing a rocket power unit for the DFS 228 high altitude research aircraft. The DFS 228 was a single-seater tailless monoplane which was carried pick-a-back by a Do. 217 aircraft to an altitude of 40,000 ft. where it was launched. It then climbed to 98,000 ft. by stages, using the rocket unit intermittently, and by this procedure attained a maximum range of 750 miles from the launching point.

During the latter part of the war, Walthers also resumed their development of propulsive ducts and achieved fuel consumptions of the order of 7.2 lbs. of fuel per lb. of thrust per hour.

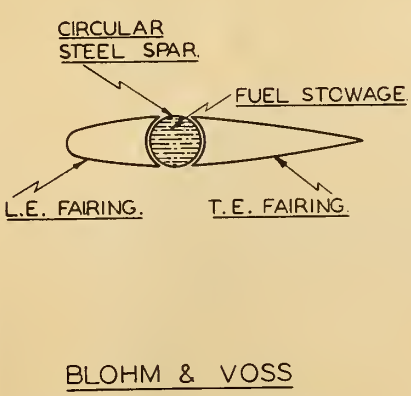


AUTOMATIC ELECTRIC SCREW JACK LOADING SYSTEM FOR STRUCTURE TESTING.

FIG 48

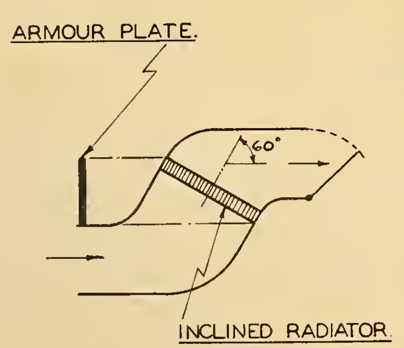
The Focke-Wulf Structures Laboratory at Detmold

The Structures Laboratory of the Focke-Wulf aircraft plant had been evacuated from Bremen in 1942 when the Allied bombing offensive threatened the factory. The Laboratory was well-equipped with testing machines of all types and sizes and included a large static testing frame. It was obvious that Focke-Wulf attached great import-



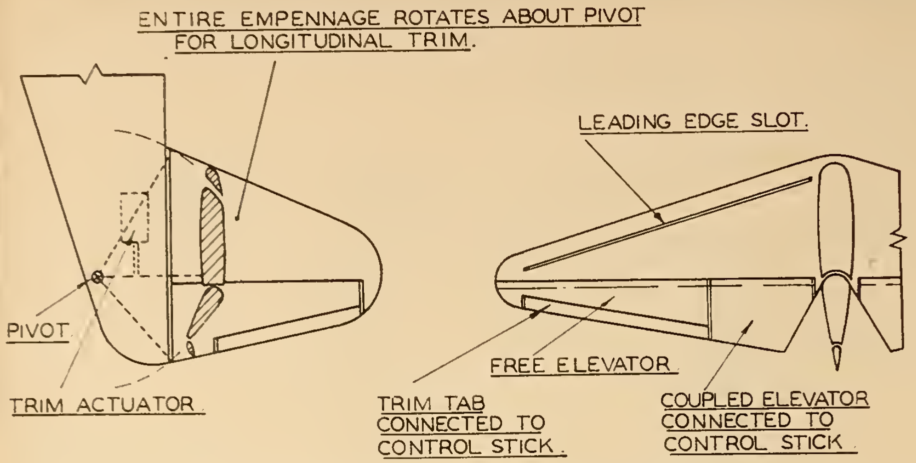
BLOHM & VOSS WING CONSTRUCTION.

FIG. 49



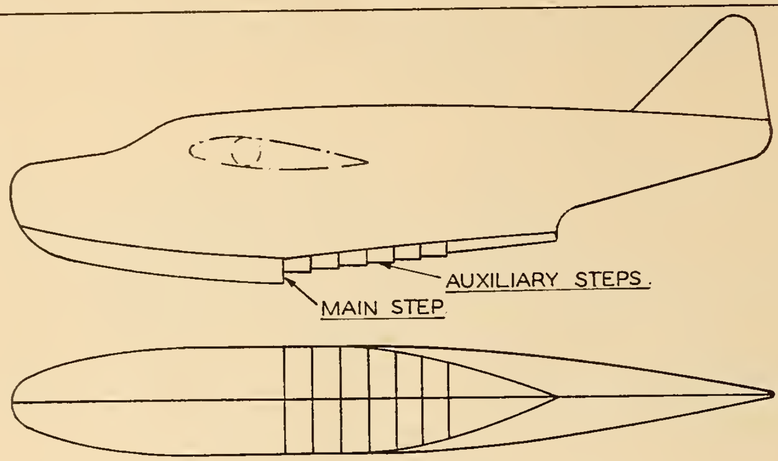
D.V.L. INCLINED FLOW RADIATOR.

FIG. 50



MANUAL ELEVATOR CONTROL ON BV 238 FLYING BOAT

FIG. 52



MULTI - STEP HULL ON BV 238 FLYING BOAT.

FIG 51

ance to dynamic testing of structures, as most of the test machines incorporated means for cyclic application of loads.

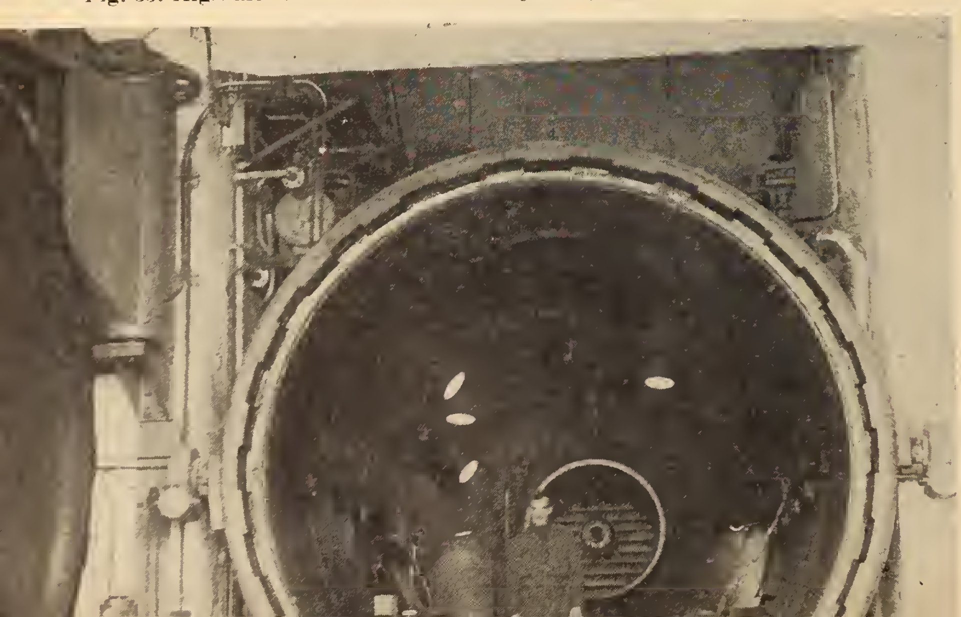
Focke-Wulf, due to the shortage of light metals, began in 1943 the development of aircraft structures employing wood and steel components. The steel construction was considered unsuitable and was dropped in the early stages, but the design of an all-wooden twin-engine fighter aircraft, the TA 154, (a copy of the British de Havilland "Mosquito"), was carried out. In consequence much of the work of this Laboratory was devoted to the development and testing of wooden structures.

The German wooden construction was much heavier than employed on the "Mosquito", probably due to the lack of light filler materials, such as balsa wood for stabilizing the plywood panels. A very comprehensive investigation of wood gluing was undertaken, in which all of the various factors affecting the strength of the bond, such as surface texture, grain direction, moisture content, glue composition and properties, drying time, temperature and duration of cure, glue line thickness, application technique, etc, were investigated.

In connection with the testing of wooden structures, an interesting technique was employed to determine which element of the structure failed first. This consisted in the use of an aluminum foil tape cemented to the various components so that upon fracture an electrical circuit was opened.

Another interesting technique for controlling the loading of the large static test frame was developed, using electrically actuated screw jacks. These screw jacks operated in conjunction with a "ring" type dynamometer which incorporated a variable rheostat actuated by the deflection of the dynamometer, as indicated in Fig. 48. The dynamometer rheostat formed two arms of a Wheatstone Bridge circuit. The other arms of the bridge were located in the control panel and their ratio was adjusted in advance to give a predetermined load. Until this load was reached and the bridge was balanced, there existed an electrical unbalance which, through relays, drove the electric motor in the screw jack in the appropriate direction to achieve balance. This system had the same advantage as hydraulic loading systems, in that distortion of the structure did not alter the load applied. In addition this arrangement also had the advantage of instantaneous irreversibility when failure occurred and permitted the reproduction of a given deflection pattern using manual control.

Fig. 53. High altitude test chamber for jet engines at B. M. W. Plant, Munich.



The Blohm & Voss Aircraft Works at Hamburg

This plant was a comparatively small establishment devoted principally to the experimental development of seaplanes and flying boats and did not engage in large-scale production. It was a branch of the very large shipbuilding interests of the same name and this may serve to explain the extensive use of boiler plate and structural steel in Blohm & Voss aircraft. The firm claimed to have obtained satisfactory results in the use of arc welded manganese and carbon steels for the primary structural elements of their aircraft. For example, a circular steel tube formed the main spar in the wing of their large flying boats, to which leading edge and trailing edge fairings were attached (Fig. 49). This spar was also used for fuel storage.

Blohm & Voss were developing two large flying boats, the BV 222 weighing 53 tons and the 6-engined BV 238 weighing 99 tons, both of which incorporated several novel features. The hull comprised a single shallow main step, together with an unusually large number of small auxiliary steps, about 1 in. deep, spaced at 3 ft. intervals, which were internally vented (Fig. 51). All controls passing through the wings were actuated by torque tubes to eliminate any adverse effects due to structural deflection. For manoeuvring on the water, an ingenious throttle arrangement was used, whereby sideways motion of the master throttle gave differential motion of the individual throttles.

To achieve adequate control without the necessity for power boosting, the larger part of the elevator of the BV 238 floated freely (Fig. 52), and its position was controlled by the movement of a servo tab on the trailing edge, which was actuated by the pilot's control. To provide aerodynamic " feel " of the control forces, a smaller inner portion of the elevator was connected directly to the pilot's stick. For longitudinal trim, the entire empennage was rotated about a hinge point below the tailplane (Fig. 52), to change its incidence. A fixed slot was incorporated in the stabilizer to maintain flow at high incidence.

Blohm & Voss also had under development a high altitude, single-engine fighter, the BV 155, designed to operate up to 55,000 ft. Here, in addition to the usual main wing spar of structural steel, the pressurized fuselage cockpit was also built up from welded steel plate. An unusual feature of this aircraft was the location of oversize radiators and supercharger intercoolers in the wings midway between the fuselage and wing tip. This aircraft was reputed to have a maximum speed of 430 m.p.h. at 50,000 ft.

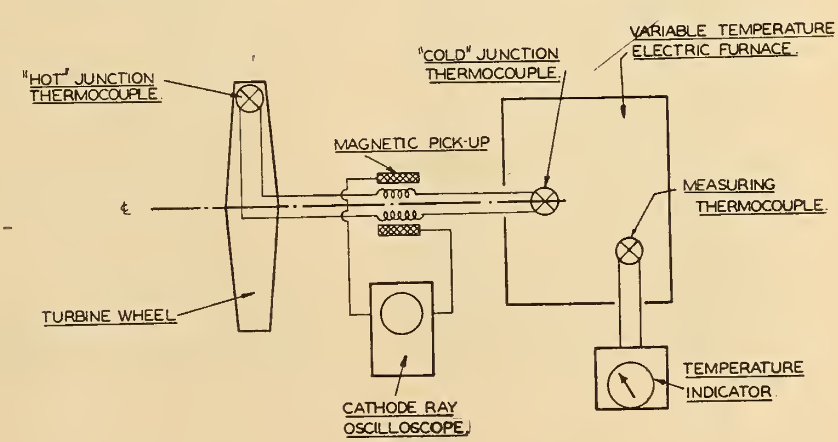
Another project in the preliminary stages was a jet-propelled fighter aircraft in which the pilot was seated astride the welded steel intake tube for the jet engine, which also served as a primary fuselage structural element. The layout included a high wing, with the tail being carried on a boom.

The assembly jigs being used for the construction of the BV 238 were of some interest, since they were capable of wide adjustment to permit their use in construction of aircraft or components of various sizes and types. The jig was fabricated from standard steel tubing connected by swivelling clamping rings at the joints, each ring being fitted with numerous lugs for the attachment of additional members. It was not attached to the concrete floor, but rested on pads and was equipped with screw jacks for vertical adjustment.

Blohm & Voss were also engaged in the production of guided missiles, and had employed a unique construction for the mass production of wings for the BV 246 glider bomb which incorporated radar target finding. These wings had the unusually high aspect ratio of 20, which presented a particularly serious structural problem. The wings were therefore fabricated from a spar, consisting of a stack of welded steel plates, onto which a concrete fairing was cast to give the required aerofoil shape.

Bayerische Motoren Werke at Munich-Oberwiesenfeld

The tremendous B.M.W. plant, which manufactured both reciprocating and jet engines for aircraft, had been severely bombed, with the result that a large part of the manufacturing facilities were dispersed to underground plants in more remote parts of Germany. However, the extensive research and testing facilities still remained. In particular, the elaborate high altitude test plant, capable of testing both reciprocating engines and jet engines, was unique. The facilities for testing of jet engines overshadowed anything existing in either the United States or the United Kingdom; consequently the plant was operated for some time after the cessation of hostilities in testing jet engines from the U.K. and U.S., prior to the dismantling



D.V.L. COMPARISON METHOD FOR MEASURING TEMPERATURE ON ROTATING TURBINE BLADES

FIG. 54

of the establishment in accordance with the terms of the Potsdam Agreement.

The engines under test were enclosed in a high altitude chamber (Fig. 53) having a diameter of 13 ft. and a length of 26 ft. The power from reciprocating engines was absorbed by a 5,000-hp. water brake and a 1500-hp. electric dynamometer which could be employed to give, when required, a total power absorption of 6500 hp. The thrust of the jet engines was measured by a simple mechanical balance.

The pressure in the chamber could be reduced to 0.08 atmospheres corresponding to an altitude of 55,000 ft., this being accomplished by the use of two multiple-stage centrifugal exhausters. These exhausters, which removed the products of combustion, could be connected in series or parallel to suit the requirements of the test. In order to reduce the temperature of the exhaust gases of the test engine and prevent damage to the exhausters, water was sprayed into the exhaust stream which in addition was passed through an air heat exchanger.

Charge air was supplied to the engine under test from a 3-stage centrifugal compressor, delivering a maximum of 55 lb. of air per second with a compression ratio of 2.4. This intake air was then passed through a water heat exchanger which could be used for heating the intake air, although normally the air was cooled. The air then passed through a brine spray cooler, the brine being refrigerated by a 7-stage, Freon system of 1000 hp. capacity. The minimum temperature of the air upon leaving the brine cooler was − 15 deg. C.

If further temperature reduction was required, the air was passed through an expansion turbine to produce useful work by circulating air through the exhaust heat exchanger, thus reducing the intake air temperature to a minimum value of − 70 deg. C. The air was then ducted directly to the engine in the altitude chamber, thereby giving the necessary ram pressure. With this arrangement air could be supplied to the test engine at any temperature from +50 deg. C. to − 70 deg. C. The intake air entered the chamber at one end and the exhaust from the engine was extracted from the other (Fig. 53). The entire operation of the plant was electrical and the controls and instruments were all located on a single central panel.

Advantage was taken of the elaborate compressor equipment provided in the test plant to operate a high speed wind tunnel, which was used principally for small scale tests of jet engines. The tunnel had an open jet 1.64 ft. in diameter and was enclosed in a chamber which could be evacuated to 0.1 atmospheres pressure. Using the exhausters for the test chamber, a total driving power of 8,000 hp. was available for this tunnel. Both "hot" jet tests (in which heat is added) and "cold" jet tests were carried out in this tunnel and wake survey equipment was employed for measuring the thrust produced.

Deutsche Versuchsanstalt für Luftfahrt—Outstations

Sonthofen

Owing to the severity of the bombing of the Headquarters of the D.V.L. at Berlin-Adlershof, the various laboratories were dispersed to remote sections of the country, the thermodynamics and materials groups being located at Sonthofen in southwestern Germany.

The thermodynamics group were concerned primarily with radiators and radiator ducting. A small wind tunnel 1.64 ft. in diameter, giving a speed of 164 feet per second, was enclosed in a refrigerated chamber, for testing oil radiators at temperatures down to − 60 deg. C. This installation had just been completed and was capable of handling oil radiators up to the size required for a 2,000 hp. engine. In addition, two smaller blower tunnels were available for special tests on heat exchangers and radiators. Considerable development of aluminum radiators had been undertaken owing to the shortage of copper in Germany, and a successful radiator had been produced having a weight only half that of the equivalent copper radiator. Considerable work had been done on inclined flow radiators (Fig. 50), which reduced the frontal area of the radiator and readily lent itself to simple lightweight armouring. Inclinations up to 60 deg. could be employed without excessive losses.

This group was also responsible for the development of the boundary layer removal system for wing radiators (Fig. 21), in connection with full-scale tests being carried out in the A.V.A. tunnels at Reyershausen. Much work was done on radiator intake design, in order to develop the best form of diffuser to achieve most efficient heat transfer. A satisfactory theory was derived to obtain any desired pressure distribution at the walls, and hence to design a diffuser giving a uniform pressure distribution and therefore no flow separation from the wall. Two small blower tunnels having glass walls were used for the diffuser tests, one of which was utilized in studying the effect of flow separation upon radiator efficiency. This laboratory was also equipped with a Mach type interferometer having a field of view 6 in. by 6 in. for studying high speed air flow, but it was considered that much development was needed on this type of instrument before the data could be correctly interpreted to give quantitative results.

The Materials Laboratory was well-equipped with special instruments for the fundamental investigation of material properties. Equipment for measuring the physical properties of the material, X-ray equipment, dilatometers, and a Leitz metal microscope, having a magnification of 2,000 times, were available. Problems under study included the investigation of residual stresses in spot welds, the diffusion of copper into steel in connection with bearing problems (where it was found that the diffusion could be prevented by the addition of a small amount of phosphorous to the steel) and a study of casting alloys of aluminum incorporating small percentages of copper and silicon.

Garmisch-Partenkirchen

This small laboratory was engaged entirely upon fundamental engine problems, and included some work on gas dynamics. Among the projects undertaken was the cooling of gas turbine blades, the liquid oxygen boosting of engines for emergency power, the control of jet engines, the calculation of entropy tables for products of combustion and a study of combustion processes, including fuel atomization and ignition lag in gaseous explosions.

An ingenious method for measuring the temperature of rotating bodies was developed (Fig. 54). This employed a "null" method of indication, the "hot" thermocouple being connected through the primary circuit of an electro-magnetic pick-up to a "cold" junction located in a controlled atmosphere but mounted on the rotating body. The temperature of the controlled atmosphere was adjusted until there was no current in the thermocouple circuit, as indicated by the magnetic pick-up which was connected to a cathode ray oscilloscope. In this way the errors usually introduced by slip rings in thermocouple circuits were overcome since even the best thermocouple slip ring arrangements, employing silver rings and silver graphite brushes containing 85 per cent silver, were unsatisfactory above a ring velocity of 33 feet per second.

Aerodynamics Institute of the Aachen Technische Hochschule

Sonthofen

With the increasing weight of the bombing offensive, the supersonic wind tunnels from the Technische Hochschule at Aachen were evacuated to Sonthofen, where they were housed in the same building as the D.V.L. Laboratory. The large tunnel had a 7.87 in. square open jet enclosed in a chamber, and was capable of achieving a Mach number of 2.7 for 5 seconds using a vacuum storage of 3530 cu. ft. capacity. The diffuser walls were flexible and could be adjusted to give various Mach numbers, while a pneumatically-operated plug valve was used to connect the tunnel to the vacuum.

The second intermediate tunnel had a 4 in. square working section and achieved a Mach number of 3.1 using the standard A.V.A. electrically-operated plug type valve. This tunnel had been used for drag and pressure distribution measurements on projectile models. The third tunnel was 3.15 in. square by 31.5 in. long and incorporated glass sides for use in studies of the formation of shock waves in diffusers and the recovery of energy in the flow. The speed of this tunnel was controlled by means of a throttle valve.

Conclusion

The picture of German Aeronautical Research and Development which we have attempted to paint here is composed from the more important information collected at the various targets visited. In covering so wide a field in the brief period of nine weeks, it is inevitable that all we could have hoped to achieve would have been a somewhat superficial appreciation of the broad aspects of the subject.

The material presented in this article, taken in conjuction with the more detailed information gleaned by other investigators concentrating on narrow specific subjects, together with the wealth of German technical reports now emanating from the hands of the translators, will perhaps be useful in allowing a critical appraisal of the achievements which the Germans had made in aeronautics.

The thought remains that a certain brilliance and daring was associated with their basic conceptions of the application of science to aeronautics and aeronautics to warfare. That they came so close to success but failed in the ultimate struggle may be due to many separate factors, but lack of close co-ordination and poor timing played a large part.

The Authors

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Notes on Management

(*See also page 31*)

The decision of the Institute's Publications Committee to devote some portion of the space in each issue of the Journal to the subject of Management is in my opinion, a significant step forward. More and more engineers are finding themselves in positions where technical ability is not the primary requirement. The trend of engineers towards managerial positions is already well established.

In the conduct of these notes on management, the objective will be to bring to the attention of engineers, significant events in the field of management and to provide leads which they may follow up for themselves. Comments and enquiries will be welcome. The more the readers participate, the more valuable will be these notes.

Because of the time interval between the writing of material and its arrival in the hands of the reader, it will not be possible always to inform readers of what is to happen—rather will these columns contain comment on what has happened. Indicative of this was the recent visit of Professor Schell of Massachusetts Institute of Technology to Montreal under the auspices of the Graduate Society of Ecole Polytechnique. Dr. Huet Massue and his associates are to be congratulated for their enterprise in arranging this forum. It is hoped that the Journal will cover the event more fully when the proceedings have been compiled.

C. E. GELINAS, M.E.I.C.,
Chairman, Publications Committee.

Training for Management and Administration

One of the noteworthy features in the management field is the spate of schools and training courses that are being offered.

The University of Western Ontario held a course in September that ran for about four weeks and was designed to meet the needs of men holding supervisory positions in industry and commerce. In addition the undergraduate and graduate courses in Business Administration have been revised.

Toronto University started a Graduate Course in Business Administration two or three years ago. The first class of graduates has now gone out into the active field, and it may soon be possible to obtain some evaluation of the effectiveness of the course.

The School of Commerce at McGill University is preparing to inaugurate Graduate Courses in Commerce and Administration next year, as well as Courses in the field of Industrial Relations.

About a year ago the School of Commerce at McGill University, in consultation with the Institute of Administration, launched an Extension Course in Management and Administration to extend over two years. This course is now in its second year and has proved so popular that some students have had to be refused as the maximum enrolment had been reached.

In addition there have been a number of short term schools run by Industrial Consultants which are reported to have had capacity attendances.

All this points to the fact that men with all sorts of backgrounds, when they get into executive positions, feel the need of wider training and education. That this is true of engineers has been stated many times to the writer of these notes.

The Society for the Advancement of Management has recently completed a survey of Management Education in which they circularized five thousand heads of business and five hundred deans and professors in schools of business administration. Usable reports were received from nine hundred and fifty executives and two hundred professors. The purpose of the survey was to: 1) ascertain the degree to which the training presently offered met the needs of employers of the graduates from the schools; and 2) obtain the opinions of the professors about the adequacy of the curricula. The results of the survey have been published in *Modern Management* for November, 1948.

The natural line of promotion for any engineer who is not wholly concerned with design, is to supervisory positions where a knowledge of management and administration is a necessity. The engineer who is looking forward to such a future will be wise to prepare himself by taking such courses as are available in his vicinity. If there are no such courses open to him the engineer can map out his own, and by systematic reading and participation in conferences dealing with subjects in this field, can go a long way towards the goal.

The beginner will probably be wise to start on one of the numerous books offered by publishers in this field. One of the newest is "Industrial Organization and Management" by Bethel, Atwater, Smith and Stackman, published by McGraw-Hill Company. There are many others of the same type, any one of which will serve to introduce him to the field. If he is interested in learning something about the historical figures in the field and the nature of their contributions he will find a very good compilation in "Industrial Management In Transition" by George Filipetti, published by Irwin. The Human Relations aspects are emphasized in "Human Factors In Management" by Schuyler Dean Hoslett and published by Harper Bros.

The *Journal Of Advanced Management* and its companion, *Modern Management* are published by the Society For Advancement of Management, 84 William Street, New York 7. Both these journals can generally be relied upon for useful and interesting material.

The Institute of Administration of Montreal has just issued its second volume of proceedings, being papers presented at their meetings in 1945-46. Copies are available from the secretary, 1420 Sherbrooke Street West, Montreal.

Canada is now a member of CIOS (Comité International d'Organization Scientifique), the International Committee of Scientific Management, through the Canadian Management Council, of which the E.I.C. is a member. Plans are under way to have a Regional Conference of CIOS in connection with the annual meeting of the Institute in May at Quebec. Further announcement of this will be forthcoming when plans are matured. The next International Management Congress is planned for 1951 in Belgium. The European nations are looking to Canada to take an increasing part in the International movement and the officers of the Canadian Management Council hope that they will get sufficient support to make that possible.

J. A. C.

TWO BRIDGES AT THREE RIVERS

(*Continued from page 18*)

was mounted on the east abutment, and handled the steel off the trucks to a storage area or to a barge. The heaviest pieces to be handled were the pier sections of main girder weighing 20 tons each.

The west crossing was easily accessible by water, and as a consequence all material was loaded on barges at the fabricating plant and towed by tugs to the Three Rivers harbour. There, small motor boats brought the barges to the site. The heaviest pieces on this bridge are the 110-ft. end girder sections weighing 31 tons each. The pier sections weigh 28 tons each and the 105-ft. centre sections weigh 24 tons each. A 35-ton derrick mounted on a steel scow 40 ft.-by-130 ft. was used here.

The sequence of erection was similar for both bridges. Considering the east crossing, with derrick scow on the south side, the pier members were placed on the first pier away from the abutment. Then followed the first upstream girder pier section. It was placed on the pier member and blocked at the bottom flange to long transverse timbers on each side of the pier member. Wood struts from the ends of the long timbers to the top flange of the girder section stabilized the girder section temporarily. The pier members on the abutment were then positioned, followed by the first upstream end section of girder. This section rested on its pier member at its east end and connected to the pier section of girder by the temporary bolted splice at its west end.

Similar operations erected the downstream pier section and end section of the main girder. Then followed the assembly of pier frames, floorbeams, temporary bracing and floorbrackets on the south side. Erection progressed westward in the above manner by placing the next pier section, followed by the intervening centre section.

A feature of the erection of special interest is the main girder field splice. It must be adequate in strength to resist the shear and bending moment that occurs during steel erection, and also adaptable to the proper full strength welding of the flanges and web. The flange splices are attached to the flange by four Mayari steel bolts and one drift pin on each side of the splice centre and in each side of the girder web. The drift pins are usually placed in the second hole away from the centreline of splice. The upper bars on each flange engage three holes only on each side while the lower bars on each flange engage all five holes.

The web splice consists of a 6 in. by 5/16 in. flat 6 ft. 3 in. long, placed on the inside web face, and bolted to the girder webs by a single row of bolts at 6-in. centres on each side of the splice centre. A ⅛-in. backing bar is inserted on the underside of the weld groove before bolting up the flange splice. A similar backing bar is inserted between the web splice plate and web groove. Before welding, the upper splice bars of both flanges are removed, leaving a clear access for downhand welding of the flanges. Flanges of opposite girders are welded simultaneously by two different welders starting with the top flanges. When the flanges are about half welded the drift pins are removed, thus loosening the connection sufficiently to permit contraction without undue strain. The welding of the flanges is then completed. The web is then welded, working from top to bottom, using a stepped procedure. Welding of a span commences after two spans forward have been erected. While two men weld the four main girder splices of a span, four other welders complete the welding of the pier frames, floorbeam and floorbracket webs. Rivetters complete the job by rivetting the floorbracket flanges, kneebraces, shelf angles and fencepost sockets.

A special sequence for pouring the floor slab was established, to assure that there would not be any reversal of stress in the main girders. This sequence required that the portion of the slab over the pier section and approximately equal in length to it, be poured prior to the centre section immediately proceeding that pier section. Three spans were fully completed before slab pouring was allowed to commence. Two spans had to be completed ahead of any one span to be poured.

Erection started on the east crossing in April, 1947, and with a force all told of about 36 men the west crossing was completed in October of the same year.

From Month to Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Unification of Threads

Elsewhere in this issue is published the history of the project leading to the unification of screw threads, and considerable of the technical data. The recently signed agreement between the United States, and the United Kingdom and Canada, is of great significance, not only for the greater economies that will follow in industry but also for the encouragement it gives to international negotiations. In a world where nations around the table seem to differ so widely on so many subjects, it is indeed encouraging to discover that at least occasionally an acceptable agreement can be reached.

This was no simple matter. The discussions reached back almost forty years. Meetings took place in England, the United States and Canada. Between official meetings small groups and individuals, in spite of what seemed insurmountable difficulties and disheartening delays, kept hammering at it. It must be very gratifying to them to see some real attainment at last. To such persons is owed a great debt by industries and by nations.

In Canada the Canadian Standards Association has been working for many years with the agencies of other nations. The Hon. C. D. Howe, HON.M.E.I.C., in his capacity as Canada's representative on the Combined Production and Resources Board, has given strong support to the proposals. General A. G. L. McNaughton, M.E.I.C., has also done much to advance the cause. Perhaps the greatest credit for Canada's contribution should go to Neil Peterson, Chairman of the Canadian Standards Association Committee on Screw Threads. He has been in the thick of it all for many years and was one of those who would not give up in spite of all the discouragements.

The new thread system, to be known as "the Unified Screw Thread System", seems to provide for threads much closer to the present United States standards than to the British. The new form of thread is to have the same angle as the present U.S. standard, i.e., 60°. For the Americans the only change is that the root is now to be rounded instead of flat. In practice this may mean no change at all inasmuch as the taps and dies for flat roots become worn at the corners and actually produce a curved root. Although not technically meeting the American standard such form of root has been accepted very widely, particularly for loose threads.

On the other hand, the acceptance of the 60° angle means to the Britisher that none of his present tools can be used for the new standard. This is indeed a serious matter, but apparently British industry and government have concluded that it is better to have unification at any price than to risk going through the experience of the late world war. To observers here who have not been a part of these long negotiations it appears that the British have made agreement possible by unselfish compromise and sacrifice, in the interest of a great international cause.

The agreement on the unified thread does not mean instant change over. It will be the responsibility of each section of industry in each country to decide for itself when it will adopt the new standard or if it will adopt it at all. However it appears that the desire for a widening export trade by the Old Country will require a change to the new thread before long.

There are other matters still to be settled in the field of uniform standards. One of these not referred to in the news of the new agreement relates to draughting room practices. These differ widely between the countries. Fortunately the agencies working on international unification are to continue and before long this subject too may be agreed upon, to the advantage of all.

In the meantime it is a matter of great satisfaction that these three English-speaking nations have come to an agreement that may presage the ultimate solution of all similar problems.

Engineers for Engineering Work

The International Joint Commission is one of the most important international bodies on which Canada is represented. It is made up of six members—three appointed by the United States and three by Canada. The commission adjudicates on problems involving the interests of both countries, but principally is concerned with the division, use and control of all waters that lie on the international boundary or cross from one country to the other.

When one considers for a moment the responsibilities of this commission in connection with the proposed St. Lawrence Waterways —to take just one example—some idea can be gained of its importance. Add to this the problems involved in proper division of the waters of the several rivers which cross the border in the west and it becomes apparent immediately that this is indeed a "most important international body".

Upon the decisions of the board will depend a large part of the economic future of many parts of Canada. It is essential that Canada be ably represented. The record in this country shows all too clearly that on many matters affecting our international boundaries we have not done too well. In those instances the ignorance and lack of interest of one or more persons on the board representing the Canadian side of the argument cost Canada a terrific price. As far as the International Joint Commission is concerned the only way to be certain that the Canadian rights are appreciated and protected is to have forceful, intelligent persons on the Canadian section of the Commission who know something about the problems.

These problems are largely of an engineering nature, therefore, it seems logical that engineers should be on the commission. The Americans have recognized this principle and two of their representatives are engineers.

On November 9th the Institute wrote the Prime Minister urging him to appoint engineers to the two vacancies then open on the Canadian section. (This letter is published herewith.) Other appropriate steps were taken also in an endeavour to impress Ottawa authorities with the necessity of choosing strong well qualified men. Other organizations such as provincial professional associations took similar action. A pointed editorial appeared in the *Financial Post* of December 11th, which said among other things, "This is no time for turning the International Joint Commission into a resting place for party faithful." Editorials have appeared in several other leading newspapers such as the Ottawa Citizen, the Montreal Gazette, the Montreal Star and the Toronto Globe & Mail. Without exception they have advocated the appointment of technically qualified men.

Notwithstanding these efforts, an ex-cabinet minister, with no engineering training, aged seventy-one, and reportedly in poor health, has been appointed to fill one vacancy. It is still hoped that an engineer with the necessary knowledge and experience will be appointed to fill the other vacancy. To this end the Institute is still in communication with the Prime Minister's office.

It is expected that the balance of the story can be told in the February issue of the *Journal*.

Nov. 9, 1948

The Right Hon. Louis S.
St. Laurent,
Acting Prime Minister,
Ottawa, Canada.

Re-International Joint Commission

Dear Sir:

Following our telegram of today we would like to elaborate on the arguments in favour of the appointment of well qualified engineers to the two vacancies now to be filled on the Canadian Section of the Commission. This question was before the Council of the Institute last Saturday and I was instructed to communicate to you the result of those deliberations.

The problems before the Commission are almost wholly of a technical nature. Therefore, it seems appropriate that Canada should be represented by engineers. Actually, this is the policy followed by the United States in that they have appointed recently a second engineer to make up their section of the Commission.

We have some knowledge of the work of the Commission in terms of its economic value to Canada. The importance of securing the very best men cannot be overstated. Not only should the members be engineers, but they should be astute engineers well able to take care of Canada's interests in the company of astute engineers from the United States. Some measurement of the good work that can be done by an engineer in this position can be gathered from a study of the record of the many years that the Hon. C. A. Magrath, HON. M.E.I.C., was chairman of the Commission.

At the present time there are before the Commission several highly technical problems which will affect the economy of western Canada for all time. These are related not only to irrigation and agriculture but also to power development, flood and drought control. We have information that leads us to believe that the United States government would like to gain a larger share of some of these waters, and that in sessions to be held shortly they will endeavour to persuade our people that additional volumes of water should be diverted to them. Canadian engineers thoroughly familiar with the situation report that the water is vital to Canada and should not be allowed to go to the States.

There are many engineers in Canada who have lived with these problems all their lives and in that field are the best informed people in Canada. From this group we think the two vacancies should be filled. It is not sufficient that engineers be employed by the Commission in an advisory capacity but it is essential that they have the status and authority of a member of the Commission. If in the opinion of the United States government engineers are the best representatives, it seems logical to believe that engineers are the best representatives for Canada as well. Any decision to the contrary would seem difficult to justify.

If there is anything the Institute can do to assist the Cabinet in this matter, such as submitting a short list of qualified persons, we will be delighted to have the opportunity.

Yours sincerely,

(Sgd.) L. Austin Wright,
General Secretary

Starting Salaries

To the young engineer the starting salary is a most important consideration. To an older man it appears of lesser significance. What really matters is the remuneration offered later in life over the long period of employment and during the years of increasing domestic responsibility.

Unfortunately too often the tendency is to increase the starting wage without making adequate changes for the senior posts. Graduates right out of college are now getting at least twice as much as a few years ago, but senior engineers fall far below that. Recommended salary schedules published by many organizations show these same characteristics, and employers cannot be criticized if they accept such schedules as indicating what the profession wants. It is to be hoped that someday a proper balance of salaries will be adopted by all employers. After all in our economic system they are the ones who determine salaries, regardless of schedules.

The latest bulletin from the Bureau of Technical Personnel gives some figures for starting salaries, based on their recent experience. The figures are not much different from those established last year but it is interesting to see that the high level is being maintained. The Bureau's figures are very much the same as those developed in the Employment Service of The Engineering Institute. The table below shows what the Bureau reports.

This works out to show that only 7.7 per cent of the salaries are above $225.00 per month and only 3.9 per cent are below $175.00 per month. The figure of $200.00 has the greatest support although $205.00 is the average.

These figures are based on employment in almost every branch of engineering and of pure science. There is also a wide spread geographically, and in the type of employer. All these things add up to the indication that the basis for the statistics is pretty general and therefore sound.

STARTING SALARIES FOR MALE TECHNICAL PERSONS ON GRADUATION 1948 (Bachelor's Degree)

Monthly Starting Salary	Number of Cases	Monthly Starting Salary	Number of Cases
Below 175	39	205	30
175	155	210	82
180	11	215	101
185	20	220	19
190	42	225	160
195	47	Above 225	77
200	217	TOTAL 1000	

World Power Conference

Information has been released recently by the British National Committee about the next meeting of the Conference. The date is the week of July 10th, 1950, the location, London, England, and the theme is " World energy resources and the production of power ".

The technical programme, as announced by the British Committee, will consist of three divisions.

1. Reports of national committees dealing with (a), the energy resources of the country including solid, liquid and gaseous fuels; water power, raw materials for atomic power and (b) — an historical record of the development of the resources of the country and of prime movers for utilizing them.

II. Preparation of Fuels —

As all kinds of fuel — solid, liquid, and gaseous — can be used for the production of power, it is intended that papers contributed to this Division should deal with the various processes of preparation and refining of fuels to render them suitable as sources of power in different types of plant and appliance.

Under solid fuels, consideration should be given to the problems involved in the crushing, grinding, cleaning, and drying of fuels. The conditions to be met vary according to the nature of the raw material and the way in which it is to be used. It would be appropriate, for example, to discuss the physical characteristics of all kinds of solid fuel and the methods employed to meet the special requirements for, inter alia, carbonization, gas producers, steam raising, and furnaces generally. As an example, the consideration of the preparation and handling of pulverized fuel would come within this Division.

As the most important source of liquid fuels is petroleum, much attention should be given in the Section on liquid fuels to the preparation of petroleum and its fuel products. The fundamental principles of the processes of treatment of petroleum and its products are also largely applicable to all liquid fuels. Examples of the subjects that might well be dealt with are the principles and technology of such processes as:

(a) Separation by fractionation or solvent extraction.
(b) Degradation and synthesis by cracking, polymerization, alkylation.
(c) Refining by physical and chemical methods.

III. Production of Power —

The general interconnection of power networks has resulted in the production of power being concentrated in large electrical generating stations. Consideration should be given to the trends in the design of such stations and the determination of their most economical location. Any special features, as, for example, the use of cooling water obtained from the sewage effluent of large cities, would have particular interest.

Fuel supplies are becoming increasingly difficult to obtain, and their quality has tended generally to deteriorate. Methods of overcoming combustion and deposit difficulties, and means of compensating for the high cost of fuels are therefore of special importance. Increased pressures and temperatures of steam constitute the conventional method of improving economic results, so that thermal cycles employed and projected will be worthy of study. The capacity of the unit of plant, both of boilers and of turbo-alternators, is being increased, and information regarding the maximum power output which can be obtained per unit of weight would be of value.

Much work has been done in recent years on the development of the gas turbine, and the time is opportune to make a survey of the progress which has been achieved in its design and application.

The revival of the hot air engine constitutes one of the most interesting recent developments, and information regarding the degree of success attained with this prime mover will be welcome.

The Canadian committee has met twice to make preliminary plans for the programme and the conference. The chairman is Dr. Chas. Camsell and the honorary secretary is Mr. Norman Marr, Laurentian Building, 54 Albert Street, Ottawa, Ont. Other members of the committee are—Dr. J. B. Challies, Montreal; Mr. G. Gordon Gale, Ottawa; Mr. R. L. Hearn, Toronto; Dr. T. H. Hogg, Toronto; Dr. C. J. Mackenzie, Ottawa. Mr. Herbert Marshall, Ottawa. Mr. Victor Meek, Ottawa; Mr. John Murphy, Ottawa; Mr. L. A. Wright, Montreal; Mr. T. M. Patterson, assistant secretary, Ottawa.

Management

The *Journal* is proposing to publish monthly something on the subject of management. It may be just a news item or reference to a speech, a pamphlet or a book or it may be a technical contribution.

Professor J. A. Coote, M.E.I.C., has undertaken to prepare the material. He is well qualified in this field having studied the subject for many years. Recently he has established a two year extra mural course at McGill, which has been so successful that many more persons have applied for enrolment than could be accommodated.

Management is of vital interest to all engineers. It is the one subject that runs through all branches of the profession. Unlike many other subjects its importance increases with the passing years. At forty or fifty not many engineers have use for their calculus but almost all of them have need of a knowledge of management.

The Institute is one of many organizations that should be interested in the study of this subject. To this end a considerable portion of the next Annual Meeting will be devoted to it, and it is hoped the co-operation of other organizations will make these management sessions outstanding.

The *Journal* accepts its share of the responsibility for increasing the members' interest in the subject and their knowledge of it. The article appearing on page 26 is the first of a series.

The Engineer — A Social Innovator

The last of the functions, held this year to mark the seventy-fifth anniversary of the founding of Ecole Polytechnique, was a forum in the Ecole's auditorium, on December 1st. Held under the auspices of the Graduates' Society, the chairman was Huet Massue, M.E.I.C., and the principal speaker was Professor Erwin B. Schell, head of the Department of Business and Engineering Administration at the Massachusetts Institute of Technology, who discussed the engineer in relation to society.

Listing the tools of the engineer as the laws of nature, the lever of analysis, the unit of measure and the power of the plan, Professor Schell urged that the engineer be possessed with the strength of humility before truth, deceiving as it may be at times. The period of accelerated industrial change in which we live has introduced new stresses and strains in our social relationships, but, at the same time, the engineer has created new products, developed new methods of production and new devices which have shortened time and space, and have made severe physical toil obsolete. As an example of the social effect of the engineer's creative achievements, the speaker cited television which was causing a return to home life " at least for a time ".

As a builder of wealth, which in turn provides tax income, the engineer has a direct relationship with the government and the public. The present challenge to the engineer was for him to keep modern industry operating efficiently in all kinds of economic weather from which the public will become firmly convinced of the necessity of freedom of action for the maintenance of our standard of living. In closing, Professor Schell expressed the wish — " May the governments, in their wisdom, continue to provide that environment of freedom of thought and incentive to self development and growth that lie at the basis of our private enterprise system. It is in this climate that the engineer of to-morrow will continue most productively to grace our civilization ".

Professor Schell's address was followed by commentaries from a jury of leading Canadian engineers and one industrialist. They were: J. E. Armstrong, M.E.I.C., chief engineer of the Canadian Pacific Railway; Hugh Crombie, M.E.I.C., assistant vice-president of Dominion Engineering Co.; J. B. Stirling, M.E.I.C., vice-president of E. G. M. Cape & Co.; A. O. Dufresne, M.E.I.C., deputy minister of mines for Quebec; and H. H. Lank, vice-president of the Canadian Industries Limited.

Through the courtesy of the graduates' society, members of the Engineering Institute were invited to attend the meeting and were well represented in the audience of about 400, which included Past-Presidents J. B. Challies, L. F. Grant, and de Gaspe Beaubien, R. N. Coke, the Chairman of the Montreal Branch and most of the branch executive.

Prizes for Welded Bridge Designs

The trustees of the James F. Lincoln Arc Welding Foundation have announced a new award programme to advance the progress of welded bridge design.

The Foundation will award thirteen prizes for designs of " Welded Bridges of the Future ". The first award is $3,000.00, the second award $1,500.00 and the third $750.00. In addition to the awards for the three best designs there will also be ten honourable mention awards of $100.00 each.

The competition opens January 1, 1949, and closes June 30, 1949. Any engineer or designer who feels himself qualified to enter the programme is eligible for participation.

The bridge to be designed is a two-lane deck highway bridge supported on two end piers 120 feet apart. The bridge is to be designed for ASTM-A7-46 steel and for H20-44 loading. While the size, steel and loading for the bridge are specified, other than these specifications the designer is completely free to exercise his ingenuity. If he wishes, the designer may conceive and use new structural shapes not now available providing only that the new shape or shapes can be readily produced if and when a demand for them develops. Moreover, he may assume availability of fabricating facilities other than those now in existence.

Complete details of the rules and conditions of the programme are available in a printed brochure which can be secured upon application from The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

Correspondence

November 20, 1948

The Editor,

It seems from statistical investigations in this office that some data can be treated more easily as convergent and hyperbolic than by usual statistical methods.

The data are such as those produced by inventories, budgets, etc., where the magnitudes are discrete, separated and of insufficient number to be tractable by any of the usual distribution methods. They are almost perfectly asymetrical, and the distributions discontinuous.

The procedure is to group the data in order of magnitude and cumulate. This gives a function that seems to be hyperbolic in every case treated, so far, from actual data.

If the position of a reading is X and if the cumulated total to that place is Y, the plot of X/Y vs. X is a straight line, which can be treated as a regression line by ordinary least squares procedure. This straight line may be used for interpolation and/or extrapolation.

For example, the first ten or fifteen terms of a series of sixty readings seem able to give the total of sixty terms by extrapolation within less than ten percent. This may have wide application.

Change in the magnitude of a given reading alters its position in the array and the total beyond it, but has little effect on the overall form of the curve, or on the rectified form.

Work is continuing and will be reported when the characteristics and abilities of the method have been examined and assessed.

Morley Lazier, M.E.I.C.,
Professional Engineer,
Toronto, Ont.

November 1, 1948

R. D. Hiscocks, Esq., M.E.I.C.,
c/o The Engineering Journal.

I would like to congratulate you on the Article appearing in the October issue of *The Engineering Journal*, of which you were one of the authors, relating to "Wartime Aeronautical Research & Development in Germany."

We are considerably interested in aviation development in relation to our patent practice and there is a scarcity of material on what was done in Germany in the period covered by your article. This is gradually being brought to the attention of the public and I believe your article adds substantially to the store of knowledge in this respect.

Yours very truly,

W. R. Meredith, M.E.I.C.,
Ewart, Scott, Kelley & Howard,
Ottawa.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

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(Check address to be used for Institute mail.)

Product or Service

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Position or Title

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Degree, Year & College

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Advise changes promptly

News of Other Societies

The 1949 Convention of the Canadian Section of the **American Water Works Association** will take place April 25 to 27 at the Chateau Frontenac in Quebec City.

Secretary-treasurer of the Section is Albert E. Berry, of the Ontario Department of Health, Parliament Buildings, Toronto, Ont.

At the recent Annual Meeting of the **Society of Naval Architects and Marine Engineers,** New York, J. B. Woodward, Jr., was elected president of the Society for a two-year term beginning January 1, 1949. O. B. Whittaker was elected treasurer; Arlo Wilson and W. N. Landers were re-elected to the posts of assistant secretary and secretary, respectively.

The American Society of Mechanical Engineers announces that its 1949 Spring Meeting will be in New London, Conn., May 2 to 4. It is also announced that San Francisco, Calif., will be the locale of the 1949 Semi-Annual Meeting, of the Society, June 27 to 30, 1949.

The American Institute of Chemical Engineers has arranged a regional conference to be held in Montreal, September 19 to 22, 1949.

The Montreal Conference Committee of the Institute will make details of this meeting available at a later date.

The American Institute of Electrical Engineers' conference on the Industrial Application of Electron Tubes is scheduled for April 11 and 12, 1949, in the Statler Hotel, Buffalo, N.Y.

A.I.E.E. headquarters are at 33 West 39th Street, New York.

The Institute of Aeronautical Sciences' Seventeenth Annual Meeting is in progress in New York City at the Hotel Astor. The four-day Convention closes on January 27.

The 95th Annual Meeting of the **American Society of Civil Engineers** was held at the Hotel Commodore, New York City, January 21-24, 1949.

Your ACE IN THE HOLE...

for

FASTER DRILLING
SIMPLER DRILLING
LOWEST DRILLING COSTS

TYPE "L" SPECIFICATIONS

art o.	1L For 7/8" Qr. Oct. Steel	2L For 1" Qr. Oct. Steel	3L For 7/8" Hex Steel	4L For 1" Hex Steel	Colour Designation
70	......	2¼"	......	2¼"	Silver
50	......	2 3/16"	......	2 3/16"	Brown
50	......	2⅛"	......	2⅛"	Pink
00	1⅞"	2 1/16"	1⅞"	2 1/16"	Plain
00	1 25/32"	2"	1 25/32"	2"	Purple
00	1 11/16"	1 15/16"	1 11/16"	1 15/16"	White
0	1 19/32"	1⅞"	1 19/32"	1⅞"	Red
1	1½"	1 25/32"	1½"	1 25/32"	Blue
2	1 7/16"	1 11/16"	1 7/16"	1 11/16"	Black
3	1⅜"	1 19/32"	1⅜"	1 19/32"	Yellow
4	1 5/16"	1½"	1 5/16"	1½"	Green
5	1¼"	1 7/16"	1¼"	1 7/16"	Orange

odel 5L, for use with 1¼" ound Hollow Drill Steel, is the most ecent oddition to the Liddicoat rill Bit line. Socket size of 1 3/16" vercomes variations in size from andard, usual in manufocture of his size of round steel. Shank pre- aration is simple: flats to be ground n four sides of steel to the 1 3/16" ndicated size. Particularly adapt- ble for wogon drills.

Part No.	5L For 1¼" Round Steel	Colour Designation
509	2¼"	Orange
508	2 3/16"	Green
507	2⅛"	Yellow
506	2 1/16"	Black
505	2"	Blue
504	1 15/16"	Red
503	1⅞"	White
502	1 13/16"	Purple
501	1¾"	Plain

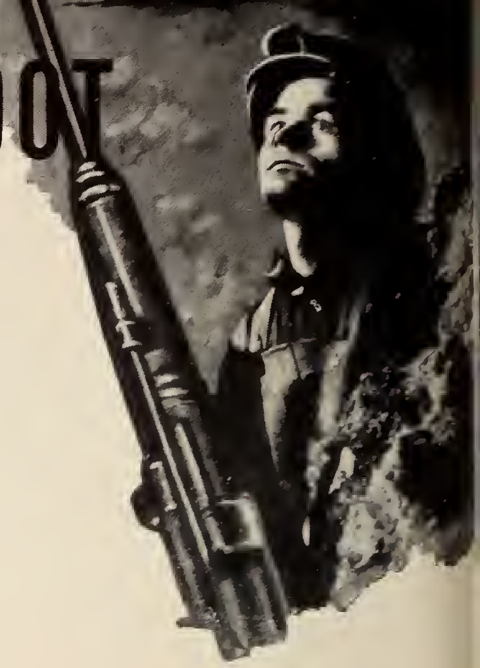
Information regarding special gauge sizes on request

TYPE "L"

LIDDICOAT
Detachable Drill Bits

MANUFACTURED BY
hompson Products, Ltd.
ST. CATHARINES, ONTARIO

LOWEST COST PER FOOT DRILLED!



NOT A "CLAIM" BUT A FACT PROVED IN CANADIAN GOLD MINES

THE Liddicoat Type "L" Detachable Drill Bit is primarily a once-usage bit—in other words, a rock bit not intended to be resharpened after it becomes dull. In view of the low initial selling price, due to production on a mass production scale, resharpening in the mine steel shop would be neither practical nor economical. A handful of bits does a whole shift's drilling!

Scientifically designed to give fast cutting performance and long cutting life, Liddicoat Bits provide not only the advantage of low first cost but of lowest-cost-per-foot drilled . . . the acid test of any rock bit for economy, quality and efficiency. For drifting, stoping, raising, sinking, they are the fastest, farthest drilling and most economical bit sold today, as well as the lightest to use. Independent records obtained throughout the mining world, when Liddicoat Bits have been tested against competitive bits or steel, confirm these facts.

Developed and proved in Canadian gold mines, thousands are being used every day to speed up production and lower drilling costs. They are also being used extensively in the Construction field, where they are equally adaptable and offer the same decided advantages.

Liddicoat Detachable Bits are manufactured by Thompson Products, among the world's largest manufacturers of essential parts for the automotive and aircraft industry. There is hardly a car, truck, bus, tractor or aeroplane made on this continent that does not contain some Thompson manufactured products as original equipment.

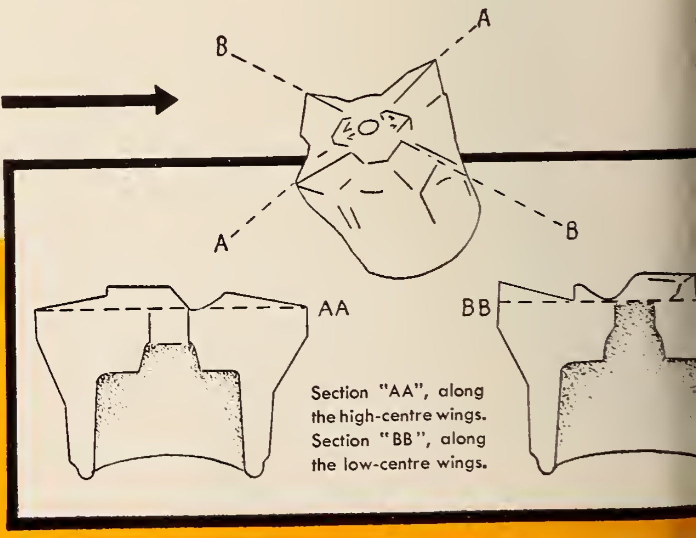
TWO-STAGE CUTTING ACTION

Since resharpening is not involved, it was possible to design the bit for maximum drilling efficiency. Liddicoat Bits actually chip out the rock, instead of battering the rock until it is pulverized, as is the case with conventional cross-bitted steel which becomes worn flat before the end of the run. This is accomplished by the two-stage cutting action and the special tooth design which retains sharp cutting portions for the full life of the bit. The cutting edges are shaped for fast drilling speed and the reaming edges for long gauge life, unhindered by considerations of regrinding and hot milling.

The advanced "pilot" portion, consisting of two raised, V-shaped "wings", chips away a centre hole and provides ease of "collaring": men using stopers or pluggers find they can "spot" holes easily without fighting the machine to keep it in correct alignment. Two cross "wings" that slope away from the centre of the bit make the first-stage cut. The other two cross "wings", with corners high and centre low, complete the cut. Ample clearance between "wings" permits cuttings to escape readily.

Two-stage cutting action described in section above is illustrated in diagram, *right.*

A HANDFUL OF DRILL BITS DOES A WHOLE SHIFT'S DRILLING !



Section "AA", along the high-centre wings. Section "BB", along the low-centre wings.

PREPARING DRILL ROD

Liddicoat Bits require no complicated attachment and are so designed to permit the attaching portion of the steel rod to be retained. Standard drill rod of any cross sectional shape and size can be prepared simply and cheaply, without the use of any special tools or machines, to fit the bit sockets.

If quarter octagon or hexagonal steel is used, operation consists of grinding the rod end, on standard machine, to print dimensions. Following this, the shank (attaching portion of steel rod) may be given heat treatment as recommended by the blueprint. The drill rod is then ready for use.

The shank may also be prepared by forging or machining. This is customary practice with most competitive bits, especially those of the screw type, the design of which makes shank preparation by such methods compulsory. However, the Liddicoat Bit is so designed that the rod end can be ground with resultant advantages. Grinding does away with all tool marks identified with machining; also the scale that is formed when steel is forged.

In case of quarter octagon steel being used (see diagram below), the four corners of the rod are ground to a cylindrical shape. Four "flats" are left remaining, corresponding to the four flat sides of the quarter octagon rod. The inner walls of the bit are shaped to correspond; the cross section of the inner walls being shaped in segments of a circle and "flats". The walls are also very slightly tapered. When driven on, the "flats" of the bit socket and shank keep the bit from turning on the rod.

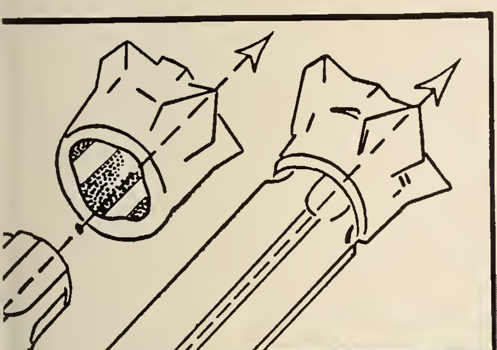
SIMPLICITY OF ATTACHMENT

The bit fastens onto the rod with a "drive" fit, as contrasted with the "screw-on" type of connection, the operation being done by the miner at the working face. After the "flats" inside the bit socket are placed in line with the "flats" of the shank, bit is partly driven on by hitting cutting teeth with a soft-faced hammer. As soon as drilling commences, machine blows drive the bit fully to the bottom of the socket, making an effective union.

Dull bits are just as readily detached from the shank, several methods being used, such as knocking off by hammer blow on bit socket or splitting socket with a special tool. A sliding weight knock-off block, which can be made in the average mine shop, provides another simple and effective method. Pneumatic detachers are also available.

SUITABLE FOR ANY GROUND

The Liddicoat Type "L" is available for use with 7/8" or 1" quarter octagon steel; and with 7/8" or 1" hexagonal steel. A special bit for 1 1/4" round steel is also available. Gauge sizes are sufficiently varied to ensure selection of bits suitable for any ground. "Wing" and gauge design allows full advantage to be taken of the modern cone automatic or hand-cranked drift machines by having longer steel changes.



METHOD OF ATTACHMENT

Diagram (left) shows the Liddicoat Type "L" Drill Bit, before and after attachment, where quarter octagon steel is used. In such case, the "wings" of the bit line up with the corners of the rod, the flat sides within the bit socket being located *between* the "wings". First machine blow completes bit seating. The harder the work, the tighter the lock.

FORGED FOR TOUGHNESS

Liddicoat Bits can be produced entirely by forging as they have no threads. By a patented and exclusive manufacturing process, the hot steel is subjected to tremendous pressure which extrudes the bits into the desired shapes. This method preserves the important grain of the steel, flow lines being compressed, rather than cut across as is usual in forgings of this type. The retention of the unbroken grain and the compression of the material give Liddicoat Bits an unusually strong material structure.

Because they are forged, Liddicoat Bits could be designed to do a much more efficient job than an ordinary cross bit. Forging also results in a stronger bit skirt and makes it possible to produce a bit much smaller and lighter than the old screw-thread type. The advantage gained in faster drilling speed through the use of a smaller bit is obvious.

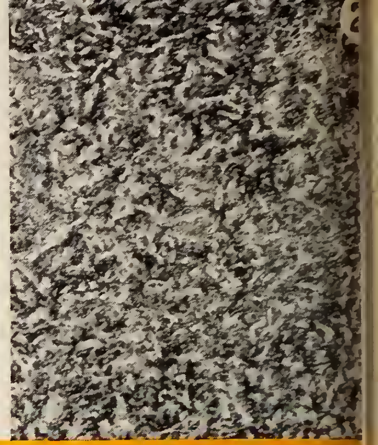
CONSISTENCY IN HARDNESS

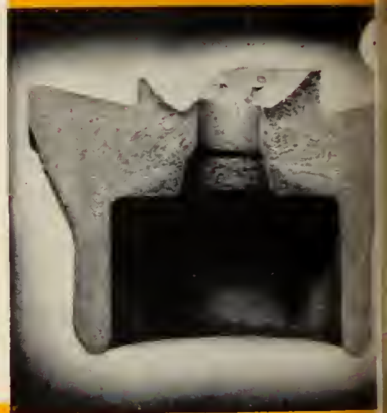
Heat treatment by the most modern methods assures consistency of hardness in all Liddicoat Bits. This means that, during its normal period of service, each Liddicoat Bit will operate at the same fast drilling speed and provide the same depth of penetration when used on rock faces of a similar nature.

A quality check is made of all materials before they are used. During actual manufacture, correct forging heats and cooling times are constantly maintained by means of accurately controlled temperatures for furnaces and quenching medium.

Every hour, during the hardening process, grab samples are tested in our metallurgical laboratory. Cutting and etching tests are made, not only for hardness and pattern of hardened bit portion, but to ensure that material flow line, grain size and uniformity of structure shall strictly conform throughout to the standards which our experience has proved to be essential for the production of rock cutting tools.

All bits are closely inspected before shipment; also painted in a distinguishing color to identify size called for by the user.





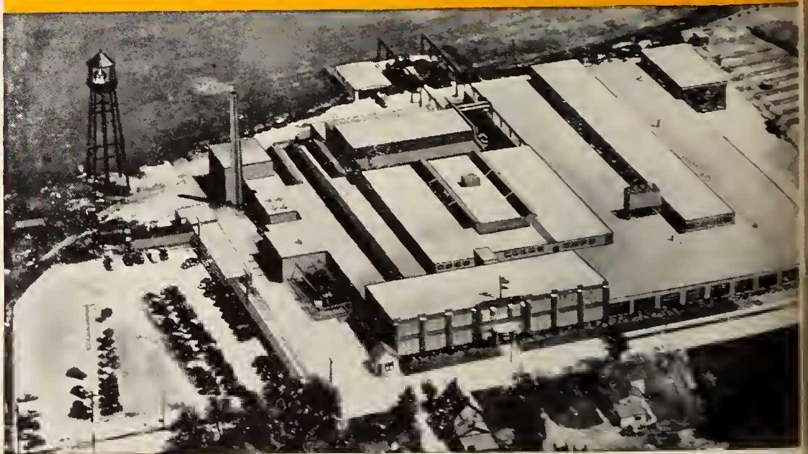
(1) Unretouched micrograph of bar stock showing structure of steel prior to heat treatment. This steel is manufactured to Thompson specifications and is regarded as the best analysis for this particular use.

(2) Unretouched microphraph showing structure of steel after heat treating. This photo shows structure of hardened portion of bit only.

(3) Sectioned drill bit, etched to show hardness pattern. Note: Photo number 2 shows the structure of this hardened portion. The remaining portion of the bit is unhardened, giving it toughness for long life.

(4) Sectioned drill bit etched to show material flow lines. This pattern is obtained by a modern forging process which also adds strength to the finished product.

(Below) Liddicoat Bits are produced for the mining and construction industries at the St. Catharines factory of Thompson Products Ltd., regarded as one of the most efficient straight line production units on the continent.



Thompson Products

THOMPSON PRODUCTS LTD. • ST. CATHARINES, ONTARIO

THOMPSON PRODUCTS INC.: CLEVELAND, DETROIT, LOS ANGELES; TOLEDO and EUCLID, OHIO

DISTRIBUTORS:

British Columbia, Alberta, Saskatchewan and Manitoba
MARSHALL-WELLS COMPANIES

DISTRIBUTORS (Construction Field):
ONTARIO
Geo. W. Crothers Ltd., Leaside (Toronto)
QUEBEC AND MARITIMES
United Continental Engines Ltd., Montreal

New Institute Branches

During 1948, the 62nd year of its existence, the Institute continued its growth and the expansion of its activities. The annual report which will appear in the February *Journal* will indicate that the branches were active and that the membership increased by more than 10 per cent.—a somewhat greater increase than the uniform rate established over several of the preceding years.

As an indication of the solidarity of the Institute, the significant accomplishment of the year was perhaps the increase in the number of branches. Negotiations were completed and a charter drawn up for the Central British Columbia branch which centers on the Kamloops and Okanagan Valley area of British Columbia. The charter is dated January 14, 1949, the date of the inaugural meeting. As this *Journal* goes to press arrangements are being made for President Finlayson to attend. Indications are that the branch will get away to a good start.

The provisional chairman and secretary of the new branch are M. L. Wade, M.E.I.C., consulting engineer, Kamloops, B.C. and Harry L. Cairns, M.E.I.C. of the Department of Public Works in Kamloops.

At the December 6th Council meeting in Montreal a charter was granted for the formation of a branch in Newfoundland. While it is expected the centre of the branch will be St. John's, it is planned that meetings will also be held at Grand Falls and at Cornerbrook in some system of rotation. The president is planning to visit Newfoundland early in May for the inaugural ceremony.

Negotiations were opened for a new Ontario branch in the Kitchener-Guelph-Galt area when, on December 16th, Vice-president Vance, W. A. T. Gilmour, Hamilton Branch chairman, and the General Secretary met with engineers of that area at a dinner in Kitchener.

Some 70 Institute members located in and around these industrial centres are presently classified non-resident members of the Hamilton branch. Enthusiasm for the new branch is very evident and it is expected that a petition for a charter will shortly be submitted to Council.

The formation of these three branches will bring the number in Canada—Newfoundland being included as the tenth province—to 32.

Personals

Notes of the Personal Activities of Members of the Institute

Brigadier J. M. Cape, M.E.I.C., was promoted from the rank of lieutenant colonel on December 16, and will command the artillery in the Third Canadian Division of the Canadian Army Reserve Force.

Brigadier Cape commanded an artillery regiment in Italy during the Second World War. In civilian life he is director and general superintendent of E.G.M. Cape & Company, Montreal engineering firm.

G. McK. Dick, M.E.I.C., formerly manager of engineering, has been appointed manager of engineering and purchasing by the Canadian Ingersoll-Rand Company Limited, with headquarters at the Company's works at Sherbrooke, Que. Mr. Dick joined the Company in 1915 as an apprentice pattern maker.

He left the Company temporarily in 1919 and studied at Bishop's College, Lennoxville, Que., and McGill University, Montreal, graduating as a bachelor of science in mechanical engineering in 1924. He then returned to the Company at Sherbrooke, and held various executive posts there and in the Sherbrooke Pneumatic Tool Company, the shell-making subsidiary of the Canadian Ingersoll Rand Company, leading up to his recent appointment.

William Storrie, M.E.I.C., Toronto consulting engineer, has been awarded the Dexter Brackett Award of the New England Water Works Association for a paper dealing with Toronto Water Works Extensions. Mr. Storrie is a past chairman of the Canadian Section of the American Water Works Association, and has been the recipient of the Fuller Award, and the Kenneth Allen Award of the Federation of Sewage Works Associations.

J. Clark Keith, M.E.I.C., general manager of the Windsor Utilities Commission, was guest of honour at a testimonial dinner given on the occasion of his retirement from the Metropolitan Hospital Board of Windsor after 20 years of service. Mr. Keith has been with the Windsor Utilities Commission since its formation in 1935, and had previously been chief engineer of the Essex Border Utilities Commission, whose functions were then assumed by the Windsor Commission.

Mr. Keith has been vice-president of the Institute for Ontario, and president of the Association of Professional Engineers of Ontario.

Gilbert H. Bancroft, M.E.I.C., has opened an office in the Canadian Bank of Commerce Building, Vancouver, B.C., and will act as a consultant in mechanical engineering, specializing in machine design. Previously he was chief engineer and a director in Engineering and Machinery Limited, Vancouver.

J. E. Armand Dugas, M.E.I.C., formerly with the industrial department of the Quebec Hydro Electric Commission, was recently appointed president of Power Survey and Equipment Limited, Montreal, Que. During the war, Mr. Dugas was with the electrical division of the Works and Buildings Branch of the R.C.A.F. No. 3 Training Command, in Montreal.

Roy W. Garrett, M.E.I.C., has been appointed city engineer of London, Ont. Mr. Garrett has been with the city engineer's department for 30 years, and has heretofore held the position of assistant city engineer. He served as city engineer in the absence of his chief during the recent war.

W. H. Paterson, M.E.I.C., was appointed in November to the post of executive assistant in the Toronto Transportation Commission. Mr. Paterson joined the Commission in 1943 after serving for several years for the Tropical Oil Company in Colombia, South America. He is a graduate of Queen's University, class of 1935.

F. C. Wightman, M.E.I.C., of Amherst, N.S., **Russell Carey** of Sackville, N.B., and **C. D. MacDonald,** M.E.I.C., of Amherst and Sackville, have established an engineering firm in Amherst, to serve the Maritime Provinces. Additional offices will be located at Sackville and at Halifax.

Mr. Wightman was town engineer in Amherst in prewar days, and also served as town engineer in recent years. Lately he has been acting as a consultant for various civic departments, in Amherst and in surrounding towns. He was at one time town manager for Kentville, N.S.

Mr. MacDonald has also been engaged in engineering work in the Maritimes. He was for some time on the staff of Mount Allison University as professor of engineering, plant superintendent and business manager. He had been in private practice in Amherst prior to the formation of the new firm.

R. G. Rowan, M.E.I.C., of the Bell Telephone Company of Canada has been appointed supervising engineer of the Laurentian District, Quebec Division of the Company. With headquarters in Montreal, he will have charge of the outside plant telephone engineering in the Laurentian Mountain Section north of Montreal.

Mr. Rowan has been with the Company since graduation in 1940 from Queen's University, and served with the R.C.A.F. in the recent war.

J. G. G. Belle-Isle, M.E.I.C., of the Bell Telephone Company of Canada, has been appointed supervising engineer of the Laurentian District, in charge of an engineering section located at Trois Rivieres, Que. He will have charge of outside plant telephone engineering in the Trois Rivieres-Shawinigan Falls Section of the Quebec Division. Mr. Belle-Isle has been with the Company since 1941. He had graduated from Ecole Polytechnique, Montreal, in 1939 and and had been connected with the Quebec Roads Department for three years. After service for some 4 years in the R.C.A.F., he returned to the Bell Telephone Company in 1946.

E. Dauphinais, M.E.I.C., is now in practice as a consulting engineer in Chicoutimi, Que. He was previously with the Saguenay Telephone Company of that city. Graduating from Ecole Polytechnique, Montreal, in 1941, Mr. Dauphinais was with the Foundation Company of Canada in Montreal until 1943, when he joined the Chicoutimi firm.

Stewart G. Harknett, M.E.I.C., became vice-president and managing director of Electrical Industries Limited, Edmonton, in Novemer last. He had been for fifteen years with Mumford, Medland Ltd., of Winnipeg, as manager of the electrical department.

J. T. Hugill, M.E.I.C., is in Paris, France, with the Department of Liquifaction of L'Aire Liquide. A graduate of University of Alberta, he received the degree of M.Sc. in chemical engineering in 1940. He worked for the Gas Commission of National Research Council at Edmonton, Alta., as a research assistant for a time that year, and later went to the Department of Chemistry of McGill University with a National Research scholarship. In 1941 he was in England at the Experimental Station at Porton, and was stationed later that year as a captain in the R.C.A., at the Experimental Station at Suffield, Alta. He was given the rank of major and served overseas, returning in 1945. He remained in Montreal, completing the requirements for the degree of Ph.D. in physical chemistry at McGill in 1946. He then joined Canadian Liquid Air Company in Montreal as a chemical engineer, remaining untl his recent appointment.

G. W. Allan, M.E.I.C., has been elected chairman of the Vancouver Branch of the Institute.

Mr. Allan is from Scotland, a graduate of the Royal Technical College of Glasgow. He served an apprenticeship of five years in that city with Mirlees-Watson Company. In Canada, in 1911, he was in the engineering office of B.C. Sugar Refining Company, Vancouver. The next year he joined the firm Allan & McKelrie, Vancouver, where he remained until 1918. He then joined Canadian Sumner Iron Works, Vancouver, in the capacity of vice-president. He was named president in 1926. He is also manager of the firm.

W. P. C. LeBoutilier, M.E.I.C., who is chairman this year of the Saguenay Branch, is with Price Bros. & Co. Ltd., Kenogami, Que.

Born at Quebec, he graduated from Royal Military College in 1926, and from McGill University in 1927. From the latter he received the degree of B.Sc. in civil engineering. He was a student engineer for Bell Telephone Company Ltd., Montreal, and was soon after named assistant district engineer in the same firm. In 1931 he went to Kenogami, Que., to the paper mills of Price Brothers as assistant to the engineer in charge of operating records. He was later placed in charge of this department. In 1937 he became assistant groundwood superintendent for the firm. He returned to the company after service for 5 years in the 2nd World War. He was attached to the Royal Rifles of Canada and was for a time a prisoner of war of the Japanese.

W. E. MacLennan, M.E.I.C.

W. E. MacLennan, M.E.I.C., has been elected chairman of the Lakehead Branch of the Institute. He is inspector of buildings and weights and measures for the city of Fort William.

Mr. MacLennan is from Scotland, where he studied, and served an apprenticeship of two years with an Edinburgh surveying firm. He spent further time with an engineering firm in London, England. In Canada he worked first in 1922 on highway construction in Saskatchewan. He did highway location work in Ontario the next year, and in 1924 he entered the field of paper mill construction and power development, with which he remained for 7 years. In 1931 he was in charge of highway location in the Province of Ontario, and was made resident engineer in 1934 on construction of the Trans-Canada Highway by the Department of Northern Development. He was named assistant engineer for the Ontario Department of Public Works at Fort William in 1936. In 1937 he went to Red Rock, Ont., as assistant resident engineer on construction of the pulp and paper mill of the Lake Sulphite Pulp Co. Ltd. there. He went to Fort William in 1939, to his present position.

W. L. Foss, M.E.I.C.

W. L. Foss, M.E.I.C., the newly elected chairman of the Lethbridge Branch of the Institute is supervising construction engineer, of P.F.R.A., Lethbridge.

Mr. Foss was born at Velva, North Dakota, but studied at University of Saskatchewan, receiving a B.Sc. in civil engineering in 1930. He worked as a field engineer for the city of Saskatoon, for four years after graduation in charge of general construction work, and in 1931-33 was resident engineer on the Broadway bridge over the Saskatchewan River.

In 1934 he worked for a time on railway location in California. In 1935 he was back in Canada and did some design and construction of water supply works for the Saskatchewan department of Public Works. He joined the staff of the Prairie Farm Rehabilitation Administration of the Dominion Department of Agriculture the same year as a junior engineer. He was named district engineer in 1936 in charge of design and construction in Southern Alberta of P.F.R.A. water development projects. For the department, he is now in charge of design and construction of the St. Mary-Milk River development.

A. Meade Wright, M.E.I.C., has been appointed assistant manager of the Atlantic Tug and Equipment Company, Inc., Syracuse, N.Y.

Mr. Wright had been with Construction Equipment Company Limited, Montreal, since 1947. He was a field engineer with Foundation Maritime Limited in Saint John, N.B., in 1946 after several years of service with the R.C.N.V.R., as a lieutenant. He graduated from McGill University, Montreal, in 1941, with the degree of bachelor of engineering, electrical.

A. C. G. Jarvis, M.E.I.C., is with the Ontario Paper Company, Thorold, Ont. He has previously been with the Quebec North Shore Paper Company at Baie Comeau, Que.

Paul E. Douville, JR.E.I.C., is assistant general manager of the Acton Rubber Company, Actonvale, Que. Mr. Douville joined the company soon after graduating in chemical engineering in 1943 from Ecole Polytechnique, Montreal.

R. F. Shapcotte, JR.E.I.C., is employed by the British Columbia Bridge and Dredging Co. Ltd., as assistant project manager on the construction of a mill for Nanaimo Sulphate Pulp Limited near Nanaimo on Vancouver Island. Mr. Shapcotte was previously with Bennett & White Construction Company Limited, Vancouver.

J. W. Fead, JR.E.I.C., is now on the staff of the University of Saskatchewan. Mr. Fead is a graduate of the University of Alberta, class of 1945, and was on the staff of that University in previous years.

R. J. Kennedy, JR.E.I.C., is at present doing graduate work in hydraulics at the State University of Iowa, while on leave from the staff of Queen's University. The American Society of Civil Engineers has awarded him the J. Waldo Smith Hydraulic Fellowship for the current year, the first award of the fellowship to a Canadian.

G. H. Green, JR.E.I.C., is employed at the University of Illinois as a special research assistant in mechanical engineering. Mr. Green received the degree of B.Sc. from University of Saskatchewan in 1944 and after service with the R.C.E.M.E. as a lieutenant he has served since 1946 as an instructor in mechanical engineering there.

W. C. Smith, JR.E.I.C., has left the wire and cable division of Northern Electric Company, Montreal, to join the sales staff of the Square D Company Canada Limited in their Montreal Office. Mr. Smith had been with the Northern Electric Company since his graduation in 1946 from Queen's University.

David Cramer, JR.E.I.C., is the newly appointed secretary of the Lethbridge Branch of the Institute. Mr. Cramer graduated from University of Saskatchewan in 1944, and joined the staff of the Prairie Farm Rehabilitation Administration as a junior engineer at Regina. He is now in the Lethbridge Section as assistant hydraulic engineer.

T. T. Anderson, JR.E.I.C., is secretary treasurer of the Saguenay Branch of the Institute.

He studied at University of British Columbia, receiving a B.A.Sc. degree in chemical engineering in 1942. He joined the Powell River Co. Ltd., but later in the year came to the Aluminum Company of Canada Limited where he was assistant supervisor of the hydrate department of the Bayer Ore Plant at Arvida, Que., up to 1945. He is now superintendent of plant development for the Company at Arvida.

A. G. Fletcher, S.E.I.C., is the secretary-treasurer of the Vancouver Branch this year. Mr. Fletcher graduated from University of British Columbia in 1948.

J. M. Carrol, S.E.I.C., graduated in engineering physics course of Queen's University in October, 1948, and joined the sales and service department of Applied Research Laboratories, Glendale, California. He is now located in Detroit, Mich., for the Company, and will work on sale, installation and servicing of the company's spectrochemical instruments in the eastern United States and Canada from a district sales office in Detroit.

Visitors to Headquarters

W. H. Paterson, M.E.I.C., executive assistant, Toronto Transportation Commission, November 25, 1948.

H. Bishop, Chief Engineer, British Broadcasting Corporation, London, England, November 30.

Lt.-Col. L. F. Grant, past-president of the Institute, Kingston, Ont., December 1.

J. Murray Fleming, M.E.I.C., President and General Manager, C. D. Howe & Co., Port Arthur, December 1.

H. W. McLeod, M.E.I.C., Canadian Pacific Railways, Winnipeg, Man., December 3.

Alan E. Cameron, M.E.I.C., President, Nova Scotia Technical College, Halifax, N.S., December 8.

P. E. Buss, M.E.I.C., President, Spun Rock Wools Ltd., Thorold, Ont., December 9.

E. D. Gray-Donald, M.E.I.C., Chief Engineer, Quebec Power Company and Quebec Railway Light and Power Co., December 9.

P. N. Bland, M.E.I.C., Vancouver, B.C., December 13.

J. M. Anderson, Vancouver, B.C., December 13.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

News reached the *Journal* only recently of the death on March 5, 1945, of **Colonel William Miles Miller,** M.E.I.C.

Colonel Miller who had been chief signals officer for Great Britain in East Africa, Madagascar and the Islands of the Indian Ocean, had retired from that position due to ill health in 1944 and lived on his farm near Nairobi, East Africa, until his death.

Colonel Miller was born in Montreal in 1891, and received his early education at Napanee Collegiate Institute. He entered Royal Military College, Kingston, Ont., in 1909 and obtained his diploma in 1912, receiving a commission in the R.C.E. the day after graduating. At the beginning of the First Great War he went to France with the "A" Corps Signal Company, Royal Engineers, and became a captain in 1915. In 1917 he transferred to the R.E. and became a major commanding the 32nd Divisional Signals Company, R.E., in the following year, and was for two years with the army of occupation in Germany. For the next fourteen years he saw service in India with the Royal Corps of Signals, and became chief signals officer, Southern Command, and was in Burma during the rebellion. In 1935 he was promoted to lieutenant colonel, and at the beginning of the recent war became colonel and chief signals officer for British troops in Egypt, and was later appointed C.S.O. of the East Africa Command extending from the Red Sea to Southern Rhodesia, and commanded the Signals at the taking of Madagascar. He was awarded the M.C. during the First Great War and the C.B.E. in 1941 for distinguished service in Libya. On his retirement he was appointed assistant director of produce disposal, East Africa Production and Supply Company at Nairobi, Kenya.

Colonel Miller joined the Institute in 1910, as a Student. He transferred to Associate Member in 1922 and to Member in 1940.

C. Camille Lessard, M.E.I.C., consulting engineer of Quebec City, died in Montreal on October 29.

Mr. Lessard, who was born in Quebec in 1889, graduated from Ecole Polytechnique, Montreal, in 1911. He was assistant to the district engineer for the Federal Public Works department at Quebec in 1915, when he became city engineer for the town of Levis. From 1917 to 1919 he was engineer for the town of Bienville, Que., and thereafter practised engineering privately in Quebec City. He supervised construction of water power developments, bridges and roads. He also designed and supervised many important waterworks and sewerage projects in the Province of Quebec. At the time of his death, Mr. Lessard was consulting engineer for a great number of municipalities in the vicinity of Quebec City.

Mr. Lessard joined the Institute in 1922 as an Associate Member. He transferred to Member in 1922.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

December 21st, 1948

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate *

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the January meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ALEXANDER—WILLIAM RONALD, of Ottawa, Ont. Born at Toronto, Ont., June 30, 1913. Educ.: B.A.Sc., (Civil), Toronto, 1935; R.P.E., Ontario; 1935, (8mos.), Dufferin Paving Co., Kenora, Ont.; 1936, (3 mos.), Toronto Iron Works; 1936, (3 mos.), Ventures Ltd., 1936-37, staff engr., Opemiska Copper Mines, development of mine which was closed in Aug. 1937 for lack of rail transportation; 1937-40, Ventures Ltd.; 1940-41, assisted in constrn. of mill buildings, underground develop't. prior to actual mining operations; 1941-42, with possibility of bauxite supply being cut off for Aluminum Co., Frobisher Exploration Co. (Ventures Limited, Toronto) was formed to search for deposits of nepheline syenite in south eastern Ontario—jointly with a mining engr. and geologist carried out investigations of all known bodies of nepheline syenite, dewatering old workings, surface and underground diamond drilling, etc.; 1942-47, Naval Service, Dept. National Defence, Ottawa; 1947 to date, township engr., County of Carleton, Nepean Township, Ottawa, Ont.

References: F. Alport, J. Dick, N. B. MacRostie, J. L. Shearer, F. A. Sweet.

BARLOW—KENNETH, of Vancouver, B.C. Born at Liverpool, Eng., Oct. 1, 1924. Educ.: B.Eng., (Civil), Liverpool Univ., 1948; Student, Inst. C.E.; 1947, (summer), structl. steel dftsman., Francis Morton & Co., Ltd., Liverpool; at present, instructor in Civil Engrg., Faculty of Applied Science, Univ. of British Columbia, Vancouver, B.C.

References: J. N. Finlayson, A. P. Hrennikoff, A. Peebles, S. H. deJong, W. G. Heslop.

BELANGER—GUY, of Montreal, Que. Born at Montreal, Sept. 7, 1911. Educ.: B.A.Sc., C.E., Ecole Poly, 1935; R.P.E., Quebec; 1936-37, dftsman., Volcano Heating Co.; 1937-39, practised as consultg. engr. in heating, ventilating & illuminating; 1939-40, designing engr., Quebec National Electrical Syndicate in connection with a power development at Rapide No. 7, Upper Ottawa River; 1940-41, elect. & power engr. at Strip Mills Co., Montreal East (now the property of Noranda Mines Co.); 1941-42, elect. power & illuminating layouts at United Shipyards Co., Ltd.; 1942-45, Sr. Elect. Engr., Naval Services; at present, (and from 1935) practised as consultg. engr. in illuminating, heating & ventilating and plumbing, (own business), Montreal, Que.

References: R. B. Delvin, G. Demers, W. B. Pennock, J. G. Chenevert, A. Frigon, C. A. Duranceau, G. N. Martin, J. Benoit.

CAMPBELL—EDWIN FRANCIS, of LaSalle, Que. Born at Montreal, Que., Aug. 18, 1900. Educ.: Registered Industrial Accountant; Member, Canadian Society of Cost Accounting & Industrial Engineers; 1915-17, master mechanic's dept., Northern Electric Co., Ltd.; 1917-19, Canadian Army; 1920, office mgr., Canadian Ice Machine Co., Ltd.; asst. accountant, Tough Oakes Gold Mines, asst. acct., Canada Paper Co., Ltd., Windsor Mills, cost acct., Fraser Bros. Construction Co.; 1920-22, cashier, Canada Cement Co., Ltd., Montreal; asst. mgr., Paton Mfg. Co., Sherbrooke; 1923-42, cost & statistical, indus. engrg., Treasury Cost Account. Divn., Ottawa; 1942-43, textile technician; 1943-46, E. F. Campbell & Co., industrial management, Montreal; 1946-48, Wallace G. Rouse Ltd., Montreal, management engrg.; 1948 to date, sr. technician, Stevenson & Kellogg Ltd., Montreal. (Asks for Affiliate).

References: J. A. Langston, P. Kellogg, J. Lefort, D. C. Dobbin, G. Dick.

COOPER—HOWARD BERNARD, of Montreal, Que. Born at Montreal, Dec. 31, 1921. Educ.: B.Eng., (Mech.), 1944; M.Eng., (Mech.), 1947, McGill Univ.; 1947-48, graduate study, Iowa State College; R.P.E., Quebec; 1944-46, Engr. Officer i/c machinery at sea, R.C.N.V.R.; 1946-47, Lecturer, Dept. Civil Engrg., (part time), McGill Univ.; 1947-48, research associate in Engrg. Experimental Station; instructor, Dept. Economics & Sociology, Iowa State College; 1948 to date, plumbing & heating instlns., design and supvrn., A. Cooper & Son, Limited, Montreal, Que.

References: C. M. McKergow, R. E. Jamieson, C. A. Robb, J. A. Coote and G. J. Dodd.

COUGHLIN—JAMES DONALD, of Port Arthur, Ont. Born at Calgary, Alta., June 3, 1919. Educ.: B.A.Sc., (Civil), Toronto; 1942; 1942-45, Lieut., R.C.E.; 1946, field engr., Barnett M. Queen Co., Ltd., Fort William, Ont.; 1947 to date, field engr., C. D. Howe, Co., Ltd., Port Arthur, Ont.

References: H. M. Olsson, J. N. McNeil, J. M. Fleming, W. H. Small, W. C. Byers.

DENNIS—GEORGE CHARLTON, of Winnipeg, Man. Born at Winnipeg, Man., May 31, 1911. Educ.: B.Sc., (Civil), Manitoba; 1939; 1940-41, engrg., dftng., Dominion Bridge Co.; 1942-43, engrg., dftng., City of Winnipeg; 1943-46, Lieut., R.C.E.; 1946 to date, engr. & asst. engr. of roads and streets, City of Winnipeg, Man

References: W. D. Hurst, J. B. Striowski, A. E. Macdonald, N. S. Bubbis, G. W. Moule.

DOWIE—JAMES GILMOUR, of Toronto, Ont. Born at Edinburgh, Scotland, March 22, 1905. Educ.: B.Sc., (Hons.), Civil Engrg., Univ. of Edinburgh, 1927; A.M., Inst. Civil Engineers, London; R.P.E., Ontario; 1923-27, apprent., D. & C. Stevenson, civil engrs., Edinburgh; 1934-36, asst. engr., Edinburgh Transport Dept.; 1936-39, asst. engr., Lancashire County Roads Dept., England; 1939-46, civil engr., Admiralty, London, Eng.; 1946-48, asst. constrn. supt., G. Wimpey & Co., ciivl engrg. contractors, Edinburgh; at present, asst. works engr., constrn. dept., H.E.P.C. of Ontario, 620 University Ave., Toronto, Ont.

References: D. Forgan, G. Mitchell, R. H. Self, R. A. Cunningham.

EARLE—GORDON JAMES, of St. Catharines, Ont. Born at St. John's, N'fld., Sept. 11, 1922. Educ.: B.Sc., (Elect.), New Brunswick, 1947; 1942-43, surveyman, E. G. M. Cape Co., St. John's, N'fld.; 1943-45, surveyman & engrg. aide, Longue Pointe de Mingan, Quebec, United States Engrg. Department; at present, test course (16 mos.), sales engrg., English Electric Co. of Canada, St. Catharines, Ont.

References: E. O. Turner, J. B. Eldridge, A. F. Baird, P. J. Farmer, R. A. Coombes.

MacNAB—ALLAN GRAHAM of Hope, B.C. Born at Vancouver, B.C., Jan. 25, 1897. Educ.: McGill Univ., 1919-21; 1925-26, instru'man, on mtce., Northern Pacific Rly., Seattle, Wash.; 1926-27, instru'man., B.C. Forest Branch, Victoria, B.C.; with Dept. of Public Works, B.C., as follows: 1927-28, dftsman., on constrn., 1928-36, instru'man., Kamloops Dist., 1936-37, res. engr., highway constrn., 1938-39, locating engr., highway location, 1940-43, res. engr., highway constrn., 1943-45, locating engr., Trans-Canada, Pine Pass, and the Hope-Princeton Highway, 1945-to date, res. engr., Section "A", Hope-Princeton Highway.

References: H. C. Anderson, H. L. Hayne, J. H. A. Steven, H. L. Cairns, M. L. Wade.

PEARCE—JOHN KITCHENER, of Quebec, Que. Born at Ottawa, Ont., June 5, 1916. Educ.: I.C.S., Scranton, Pa., 1943-48; with R.C.E., as follows: 1934-37, student mechanist, electrician, Halifax, 1937-41, asst. mechanist, electrician, Esquimalt, B.C., 1941-46, chief mechanist electrician, Esquimalt, B.C., duties involved mtce. of existing electrical instlns., supervising instln. of all elect. works on Army constrn. projects and camps for Victoria and Esquimalt, which involved inside wiring and outside primary and secondary distribution, instln. of elect. and mechanical equipt. for Army Engineer Services on Coast Defence establishments for area mentioned, etc., 1946 to date, Chief Mechanist Electrician, No. 5 Works Coy., Quebec, Que.

References: H. W. Love, T. Pascoe, J. W. Young, B. W. Waugh.

ST. ARNAUD—MAURICE, of Montreal, Que. Born at Shawinigan Falls, June 8, 1907. Ecole Poly., 1924-26; 1921-27, dftsman., John Stadler; 1928-33, dftng., designing, J. M. Guay Inc.; 1933-34, working for self, (bldg.); 1935-36, maths. instructor, Shawinigan Technical Institute; 1936-37, Stadler Hurter; 1937-45, dftsman. & designer, J. M. Guay Inc., dftsman & Designer; 1945 to date, section leader, i/c of arch. details & bldg., design, structl. steel design, reinf. concrete design, etc., on pulp & paper mill engrg., Stadler Hurter Co., Montreal, Que. (Asks for Affiliate).

References: A. T. Hurter, C. J. Jeffreys, P. Bastien, I. Kursbatt, C. R. Matthews, V. Harisay, L. Pineau.

SEAMAN-DONALD ROY, of Shawinigan Falls, Que. Born at Rouleau, Sask., July 26, 1925. Educ.: B.Sc., (Mech.), Saskatchewan, 1947; 1944, (summer), rodman & recorder, Geodetic Service of Canada; 1945, (summer), recorder, Dominion Topographical Surveys; 1946, (summer), detail dftng. & bills of material, Goldie, McCulloch & Co., Galt, Ont.; at present, industrial engr., Canadian Industries Limited, Shawinigan Falls, Que.

References: A. S. Holder, I. M. Fraser, N. B. Hutcheon, W. R. Staples, E. K. Phillips.

SMITH—ERIC HUTCHISON, of Oakville, Ont. Born at St. Catharines, Ont., May 20, 1905. Educ.: B.A., 1927; M.A., 1928, Toronto; Post-grad. course in chem. engrg., M.I.T., 1939; 1928-30, mill supt., Central Manitoba Mines; 1930-37, chemist, later works mgr., Beardmore Leathers Ltd., Acton, Ont.; 1939-45, Canadian Army Overseas; 1945-47, Lecturer in Physical Chemistry, Univ. of Toronto; 1947 to date, acting chief engr. & head engrg. dept., Standard Chemical Company, Ltd., Montreal, Que.

References: L. D. McGee, G. H. Kohl, S. G. Bennett, K. S. Maclachlan, J. G. Spotton.

STEVENSON—ROBERT HELON, of Moncton, N.B. Born at Woodstock, N.B., Aug. 10, 1913. Educ.: B.Sc., (Elect.), New Brunswick, 1934; 1934-36, rodman & chainman, Dept. Highways, New Brunswick; with Canadian Westinghouse Co., Ltd., as follows: 1936-38, engrg. student apprent. course, 1938-40, designing air conditioning equipt., 1940-41, designing motors, generators and switchboards, 1941-43, sales engr. on elect. apparatus, Montreal, 1943-46, Lieut. R.C.E.M.E.; Canadian Westinghouse Co., Ltd., as follows: 1946-47, sales engr., Halifax, 1947 to date, sales engr., elect. apparatus, Montcton, N.B.

References: W. Harrison, T. H. Dickson, O. M. Sweetser, H. A. Cooch, A. A. Moline, K. W. Fraser.

STIRLING—ARCHIE LYON, of Three Rivers, Que. Born at Winnipeg, Man., Aug. 19, 1922. Educ.: B.Sc., (Elect.), Alberta, 1947; 1947, (3 mos.), equipt. engr., Northern Electric; 1947 to date, system office, Shawinigan Water & Power Co., Shawinigan Falls, Que.

References: J. M. Crawford.

STIRLING—JOHN PORTEOUS, of Toronto, Ont. Born at Edinburgh, Scotland, Feb. 24, 1919. Educ.: B.A.Sc., (Civil), Toronto, 1941; R.P.E., Ontario; 1941-44, R.C.E.; with H.E.P.C. of Ontario, as follows: 1945-46, designing engr., 1946-48, divisional engr., main dam, Aguasabon Development, 1948 to date divisional engr., power house constrn., Pine Portage Development.

References: E. G. Tallman, G. R. Lord, O. F. Johnston, J. R. Montague, S. W. B. Black, E. B. Hubbard.

THOMSON—JAMES TELFORD, of McMasterville, Que. Born at Calgary, Alta., July 1, 1925. Educ.: B.Sc., (Mech.), Sask., 1947; 1945, (summer), student surveyer, Topographical Survey, Dept. of Mines & Resources, Ottawa; 1946, (summer), dftsman., Babcock, Wilcox, Goldie & McCulloch, Galt, Ont.; 1947 to date, industrial engrg. supervisor, Explosives Division, Canadian Industries Ltd., Beloeil, Que.

References: I. R. Tait, I. M Fraser, N. B. Hutcheon, C. R. Forsberg, A. L. C. Atkinson, R. A. Spencer.

TORA—JOSE LUIS, of Madrid, Spain. Born at Madrid, July 16, 1921. Educ.: S.M. (Mech. & Elect.), Instituto Catolico de Artes de Industries, 1946; Graduate School of Enrg., Harvard Univ., 1947-1948; 1945-46, asst. prof. in Elect. Engrg., Instituto Catolico de Artes e Industrias, Madrid; 1947-48, scholarship of Higher Council of Research of Spain to study electronics in U.S.A.; 1947, research work in high frequency measurements in the Physics Dept. of Graduate School of Arts and Sciences of Catholic Univ. of American, Washington, D.C.; 1947-48, study and research work in Graduate School of Engrg., Harvard Univ., especially in electronic and tonic conduction through cases; at present, Asst. Professor in Elect. Engrg., I.C. de A. e I., Madrid, Spain.

References: DeG. Beaubien, C. L. Dawes (A.I.E.E.), C. H. Willis, (A.I.E.E.), J. MacVeigh, (A.S.M.E.), O. R. Enriquez, (A.I.E.E.).

TRIM—CHARLES EDWIN, of Toronto, Ont. Born at Toronto, Ont., May 21, 1910. Educ.: B.A.Sc., Toronto, 1934; R.P.E., Ontario; Beamish Sugar Refineries Ltd., as follows: 1934-37, plant engr., 1937-39, plant supt., 1939-41, plant engr. & supt.; with Colgate-Palmolive-Peet Co., Ltd., Toronto, as follows: 1941-46, plant engr., 1946 to date, chief engineer.

References: E. A. Cross, E. G. T. Taylor, K. R. Rybka, C. R. Young.

WALL—PHILIP ERRINGTON, of Hawkesbury, Ont. Born at Wimbledon, Eng., Feb. 15, 1908. Educ.: City & Guilds Engrg. College, London, Eng., 1926-29, (Assoc., City & Guilds Institute); A.M., Inst. Mechanical Engineers, London; R.P.E., Ontario; with C. A. Parsons & Co., Newcastle-on-Tyne, Eng., as follows: 1929-31, apprent'ship., 1931-32, dftsman., 1932-36, tech. asst. in turbine design office; 1936-39, tech. asst. in details such as speeds, loads, etc. in application of ball and roller bearings to mchy. of almost every size and class, test & research work, etc., Ransome & Marles Bearing Co., Ltd., Newmarket-on-Trent, Eng.; 1939-47, Tech. Asst., Tech. Officer, St. Tech. Officer, supvrn. research development work in various directions concluding with aircraft gas turbine (jet) engines, Air Ministry, Ministry of Aircraft Production and Ministry of Supply, England; 1947 to date, asst. engr., Canadian International Paper Co., Hawkesbury, Ont.

References: H. J. Whiting, S. Wang, H. Anvik, F. W. B. Shaw, R. Boismenu.

WERMINLINGER—DANIEL, of Quebec, Que. Born at Montreal, Feb. 22, 1924. Educ.: B.Eng., (Elect.), McGill, 1946; R.P.E., Quebec; 1946-47, graduate engr. in training, Shawinigan Water & Power Co.; 1947 to date, Lecturer, Dept. of Elect. Engrg., Laval University, Quebec City, Que.

References: G. E. Sarault, L. A. Duchastel, C. V. Christie, C. C. Lindsay, G. A. Wallace.

TRANSFER FROM THE CLASS OF JUNIOR

ABRAMSON—ISAAC ALBERT of Port McNeill, B.C. Born at Winnipeg, Man., on Feb. 12, 1908. Educ.: B.Sc., (Elect.), Alberta, 1929; with Calgary Power Co. Ltd.; 1929-37, operation, mtce., Hydro Plants, Seebe, Alta.; 1938-39, misc. elect. wiring, elevator instalns.; with Pioneer Timber Co. Ltd., 1940-41, asst. engr. survey; 1942 to date, survey engr., location of truck roads, layout of settings for skidder, high lead logging, topographic mapping, Fort McNeill, B.C. (Jr. 1931).

References: H. J. MacLeod, H. Randle, J. A. Tames, G. H. Thompson.

ANDERSON—THOMAS TULLOCH of Arvida, Que. Born at Shetland, Scotland, on Nov. 3, 1917. Educ.: B.A.Sc., (Chem. Engrg.), B.C., 1942; R.P.E., Que.; with Powell River Co. Ltd.; 1936-42, undergraduate work; 1942, research, control technician; with Aluminum Co. of Canada Ltd. as follows: 1942-45, asst. supv. Hydrate Dept. Ore Plant; 1945-46, research engr.; 1946, develop't. engr., 1946-47, supervisor, alumina—fluoride develpt. group; 1947-48, acting assist. supt., fluoride dept.; 1948 to date, asst. supt. Fluoride Dept. (Jr. 1945).

References: A. C. Johnston, J. E. Dyck, G. T. Malby, F. A. Dagg, J. F. Braun.

BANTING—CHARLES GORDON of Babylon, New York. Born at Victoria, B.C., on Sept. 21, 1917; Educ.: B.Sc., (Mech.), Sask., 1940; summer work 1938, Power Plant, Fort San, Sask.; 1940, trainee, Sask. Power Comm.; 1944 to date, Grumman Aircraft Engineering, experimental dept., group leader for production engrg. on furnishings, equipt. press system for Grumman Panther. (St. 1940, Jr. 1941).

References: C. J. Mackenzie, I. M. Fraser, N. B. Hutcheon, G. W. Parkinson, A. B. Olson.

BECKETT—DONALD RUSSELL of Fort William, Ont. Born at Port Arthur, on March 26, 1921. Educ.: B.Sc., (Civil), Queen's, 1945; R.P.E. Ont.; summer work, with Can. Car & Foundry Co.; 1939-43, toolmaker, jig & toolmaking dept., 1944, transitman, Can. Pacific Rwy.; 1945, Lieut. R.C.E.; 1945-46, lecturer, civil engrg. dept., Queen's Univ.; 1946, resident engr., Spruce Falls Power & Paper Co. Ltd.; 1946-48, design engr. The Great Lakes Paper Co. Ltd.; at present, asst. chief engr., Marathon Paper Mills of Can., Woodlands Div. i/c survey, superv. of constrn. layouts, communi., design of buildings. (St. 1942, Jr. 1947).

References: L. F. Grant, A. Michelson, S. T. McCavour, C. Boast, D. S. Ellis, H. M. Olsson.

BLOOM—DAVID of Montreal. Born at Russia on Feb. 15, 1909. Educ.: B.Eng., (Elect.), McGill, 1935; R.P.E., Que.; 1936-39, construct Rite Co. Ltd.; 1940-41, Dominion Gov., Dept. of Supply Depot, Mtl.; 1941-42, E. G. M. Cape Co. Ltd.; 1942-43, R.C.E.; 1944-48, general constrn. for self. (Jr. 1940).

References: E. Brown, F. S. Howes, C. V. Christie, I. S. Backler, S. J. Becker.

CAVERLY—JEFFERSON AUSTIN of Quincy, Ill. Born at Bowsman, Man., on May 20, 1920. Educ.: B.Eng., (Geological Engrg.), Sask., 1941; R.P.E., Man.; summer 1939, student asst. geol. survey of Canada; 1940, practical mining experience, Teck Hughes Gold Mine, Kirkland Lake, Ont.; 1941, with Britannia Mining & Smelting Co.; 1941-42, field engr.; 1942-45, geologist; 1945-48, constrn. engr., Howe Sound Expl. Co. Ltd., Snow Lake, Man.; at present, sales engr. taking sales training in engrg. dept. & factories, Quincy, Illinois.

References: R. A. Marvin, C. D. Osterland, R. A. Spencer, I. M. Fraser, N. B. Hutcheon.

CLARK—ALVIN IRA of Calgary, Alta. Born at Ardath, Sask., on May 24, 1914; B.Sc., (Mech.), Sask., 1940; R.P.E., Alta. 1941, production asst. Sawyer Massey Ltd., Hamilton; 1941-43, mtce. engr. Aluminum Co. of Canada Ltd., Arvida; 1943-45, R.C.E.M.E.; 1946-47, prod'n. engr., Dominion Bridge Co. Ltd., Calgary; 1947-48, asst. estimator; at present, partner in contracting firm of Evans, Clark & Henderson. (St. 1940, Jr. 1942).

References: K. G. Evans, D. W. Henderson, I. M. Fraser, W. E. Lovell, J. Smith, N. B. Hutcheon.

COPPING—EDWARD E. of Shawinigan Falls. Born at Joliette, Que. on Sept. 5, 1919. Educ.: B.Eng. (Elect.) McGill, 1941; R.P.E. Que. with Shawinigan Water & Power Co. as follows: 1937-40, transmission, communi. lines, mtce.; 1941-43, misc. power house equipt. relay engr., Rapide Blanc Power House; 1943-45, supervisor of operation; 1945-48, superv. elect. mtce. (St. 1941 Jr. 1946).

References: J. B. Stirling, A. H. Watier, A. L. Hough, L. A. Robillard, W. E. Davison, M. Eaton.

EVERALL—RONALD STUART of Dauphin, Man. Born at Portgage La Prairie, Man. on Nov. 29, 1921. Educ.: B.Sc. (Civil), Man. 1947; with P.F.R.A. as follows: 1939, irrigation survey; 1940, Dept. of Tpt. Airport Constr.; 1941, dam constrn. senior rodman, P.F.R.A.; 1942, airport constrn. inspector, Dept. of Tpt.; 1943-45, Lieut. Cdn. Army overseas; 1946, summer resident engr. Dept. of Public Works; 1947, petroleum engr. Royalite Oil Co. Turner Valley, Alta.; 1948 to date, town engr., superintendent of sewers, water works, roads and streets. (St. 1945, Jr. 1949).

References: A. E. MacoDnald, G. H. Herriott, W. F. Riddell.

HINDLE—WALTER of Hamilton, Ont. Born at Edmonton on Aug. 23, 1914 Educ.: B.Sc. (Elect.) Alta., 1937; R.P.E. Ont.; 1937-40, Canadian Westinghouse Co. as follows: engrg. apprentice; 1940 to date, engr. i/c installn. of vertical waterwheel generators, rectifiers, switchgear, general power apparatus; (St. 1937, Jr. 1943).

References: T. D. Stanley, H. Randle, A. A. Moline, L. C. Sentance, H. A. Cooch, E. M. Coles.

KENNEDY—RUSSELL J. of Kingston, Ont. Born at Dunrobin, Ont., on Nov. 23, 1917. Educ.: B.Sc., (Civil), Queen's, 1941; R.P.E., Ont.; summers 1940 & 1941, instru'man, H.E.P.E., of Ont.; 1941-46, Lieut., R.C.E.; 1946-48, lecturer Civil Engrg. Dept. Queen's; 1948, asst. to chief hydraulic engr., The Ont. Paper Co.; at present student graduate college, State University of Iowa, Iowa City. (St. 1940, Jr. 1946).

References: D. S. Ellis, L. F. Grant, S. D. Lash, R. A. Low, J. D. Lee.

MITCHELL—ROBERT WALTER of Montreal, Que. Born at Mtl., on July 13, 1911. Educ.: B.Eng., (Chem.), McGill, 1933; R.P.E., Que.; 1933, analytical chemist in laboratory, Hunt & Co.; 1934-37, control chemist i/c control lab. of Merck & Co. Ltd.; 1937-43, i/c production depts. manufacturing vitamins, miscl. instaln. & mtce. of processing equipt. in depts., production & cost records; 1943 to date, Charles E. Frosst & Co., plant engr. (St. 1933, Jr. 1940).

References: W. E. Patterson, F. J. Friedman, H. F. Finnemore, D. Heywood.

NEAL—EUGENE LAWRENCE of Quebec City. Born at Millinocket, Maine, on July 13, 1917; Educ.: B.Sc., (Mech.), Queen's, 1938; summers 1934-37, Anglo Canadian Pulp & Paper Mills, Quebec; 1938-40, industrial engr. Howard Smith Paper Mills, Cornwall; 1940, Royal Can. Airforce; with Anglo Can. Pulp & Paper Co. as follows: 1945-46, paper mill control engr.; 1946-47, asst. control supt.; 1947, control supt.; at present, asst. general supt. (St. 1938, Jr. 1946).

References: J. O'halloran, R. J. Chambers, W. E. Soles, D. Ross-Ross, D. E. Ellis.

VERSCHOYLE—PATRICK D. of Essendon, England. Born at Rogate, Sussex, on Oct. 4, 1912. Educ.: B.Eng., (Chem.), McGill, 1935; summer 1931, pulp tester; 1933-34, asst. chemist, Price Bros. & Co. Ltd., Kenogami, Que.; 1935-41, asst. to tech. mgr. Lafarge Aluminuous Cement Co. Ltd., Essex, England, assisted in direction of work of chemical & concrete testing lab, tech. corresp.; 1941, tech. asst. Royal Ordnance; 1941-43, shop mgr. of Factory, factory engaged in filling gun ammunition; 1943-45, asst. mgr., Bridgend, responsible under the mgr.; tech. developt. for new processes to factory; at present, senior scientific officer, explosives research & devlopt. establishment, Waltham Abbey, Essex, Eng. (Jr. 1936).

References: E. Brown, J. B. Phillips, G. J. Dodd.

News of the Branches

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Cornwall

G. G. M. Eastwood, M.E.I.C.
Secretary-Treasurer

T. B. Webster, M.E.I.C.
Branch News Editor

Members of Cornwall Branch and their wives learned **How Cotton Is Made** on November 22 at the Canada Mill of Canadian Cottons Limited. J. G. Sutherland, manager, gave a brief address of welcome and emphasized the importance of the industry to the community.

The mill superintendent, A. W. Tardiff, assisted by members of the staff then began a conducted tour of the plant, ably demonstrating the various operations in the processing of the cotton from the bale to the finished goods.

The tour ended at the cafeteria where refreshments were served. An expression of thanks for a most interesting and educational evening was tendered the hosts by Mr. Wallace, branch chairman.

The annual meeting of the Branch was held on December 13 at the King George Hotel. Chairman R. H. Wallace presided and reports of committees were submitted.

Mr. Ross-Ross, chairman of the Nominating Committee, announced the results of the election, in which Mr. Wallace was returned as chairman by acclamation. Those elected to serve two-year terms were H. Nickerson, F. R. Warner, and L. P. Stidwill.

Mr. Wallace reviewed the work of the Branch during the past year, thanking all members for their co-operation and interest. He also reported his trip to the annual meeting of the Institute at Banff. The civic affairs committee has been active, and two Institute members now serve on the City Planning Board where they can make a real contribution to city welfare.

After the conclusion of the business meeting two educational films were shown. These were entitled, "Exploring with X-Rays" and "More Goods for More People". They showed the parts that X-Rays and electrical control instruments play in the betterment of living conditions.

Kingston

D. L. Rigsby, M.E.I.C.
Secretary-Treasurer

J. T. Provan, Jr.E.I.C.
Branch News Editor

On Monday, 29th November 1948 the Kingston Branch of the Institute held a meeting at Gordon Hall, Queen's University. The guest speaker was L. C. Grimshaw, metallurgical engineer in charge of composite steels at the Jessop Steel Company Limited. P. Roy, chairman of the Kingston Branch, introduced the speaker.

The illustrated talk was a description of the manufacturing process for producing stainless clad steels, showing how a perfect bond is made between stainless and mild or other steels, to produce sheets and plates with one side only of stainless steel, for economy in subsequent manufacturing. Various applications of stainless clad steel in industry were pointed out, with useful information on fabrication techniques. Advantages of using stainless clad steel were mentioned such as economy, strength, heat conductivity, appearance, and aptness for deep drawn and cold press. Mr. Grimshaw concluded by mentioning standard procedures for welding, which was followed by a general discussion period.

The speaker was thanked by H. G. Conn, head of the mechanical department at Queen's University and the meeting adjourned.

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On Tuesday, 14th December, 1948, the Kingston Branch of the Engineering Institute of Canada held a meeting at the R.C.E.M.E. Officers Mess, Barriefield, Ont. The programme took the form of an estimating forum followed by a discussion and question and answer period. Members were welcomed to the Mess by Major G. T. Kirk and the meeting was presided over by Chairman P. Roy, who introduced the speakers.

Guest speakers were Mr. M. G. Saunders chief engineer of the Aluminum Company of Canada, Kingston Works, who spoke on **Cast Estimating by the Engineer** and Mr. G. Schuett of Schuett Construction Company who spoke on **Cost Estimating in Construction.**

Mr. Saunders began his talk by showing the value of an estimate and its justification. His suggested method of making an estimate was broken down into the following component parts.

All information pertaining to the job should be gathered and studied thoroughly, making sure no item is omitted. The information supplied is then broken down into its component parts. Experience on previous estimates should be utilized to good advantage. Information on accurate present day cost of materials should be obtained. The estimate should be based if possible on a cost per pound basis or other unit, depending on class and kind.

Also pointed out were the items which should be taken into account when making an estimate; such as overhead; preparatory work needed on the job before it actually begins; interference which may affect the work; facilities at hand, such as services; handling equipment necessary; clerical and maintenance work; such miscellaneous items as insurance, taxes, etc.; and contingencies.

Mr. Schuett said the accuracy of an estimate is based on the detail of the plans submitted. It was pointed out that often estimates are mistaken because the plans lack detail and the work has to be designed as it progresses.

Estimates may be calculated either of two ways. By phase building, in which each phase of the work is taken into account separately and a cost fixed for each. The second, and more common manner in this country, is the estimate based on the subdivision of the subtrades in which the job is broken down into the various subtrades with costs applied to each. In a case where the construction job is let out under subcontracts the total estimate is of course based on these sub-contractor estimates.

Mr. G. Schuett suggests the following system for making an estimate. The plans are submitted to a quantity surveyor who takes off accurate quantities of materials. These figures should be checked twice, and sent to a cost man who works on accurate information pertaining to present day prices. Finally the total estimate is submitted to the executive who makes final judgment on cost.

Both speakers mentioned labour cost in an estimate as a variable figure which greatly influences estimated cost in as much as the productivity of the class of labour obtainable at the job cannot be predetermined.

After a very interesting discussion period the speakers were thanked by Mr. D. Lee of Queen's University. D. L. Rigsby, secretary-treasurer, gave a report on forthcoming meetings.

The meeting was adjourned and refreshments were served.

Lethbridge

D. Cramer, Jr.E.I.C.,
Secretary-Treasurer

A. E. Lawrence
Branch News Editor

Forty-seven members and guests of the Lethbridge Branch of the Institute, attended a dinner meeting in the Marquis Hotel, Saturday evening, November 20th, to hear H. E. Salisbury, give an address on **Vegetable Canning and Marketing in Alberta.** Mr. Salisbury is general manager of the Alberta Canning Company.

The meeting was a Ladies' Night with the wives and friends of the members as guests. Chairman W. L. Foss presided. During the dinner, music was supplied by Browns' Instrumental Trio. Community singing ably led by R. S. Lawrence and vocal solos by Mrs. Dawn Benoit, accompanied by the Rev. V. E. Smith, were enjoyed by all. A. L. H. Somerville introduced the speaker.

In his talk to the meeting, Mr. Salisbury outlined the benefits which the canning industry brings to the farmer and the district as a whole. He stated that the green pea is an excellent plant to grow on land on which crop rotation is used, and that it has been found that sugar beets increase in yield when the green pea had been grown on the land before. They obviate the necessity of summerfallow and keep the land clean as well.

The cannery contracts all its acreage with farmers, and Mr. Salisbury stated that a farmer could net $115.00 per acre from the green pea crop and its by-products. The maximum acreage of green pea crop which one farmer could handle was about sixty acres.

The speaker outlined the method by which the various vegetables are treated and canned in the factory, and stated that there were three grades of canning done, namely "Fancy", "Choice" and "Standard". All runs are rigidly government inspected.

This year's crop of green peas was exceptionally good and the cannery was able to can 93 per cent of its run as "Fancy". There will be three million cases of peas in surplus in Canada. Mr. Salisbury also mentioned that the Canneries were perplexed by the whims of the consumer who insist on Sizes 1, 2, or 3 peas when the No. 4 is superior in quality and taste.

In conclusion the speaker stated that few areas are as good for canning crops as this of Southern Alberta and that he could safely predict that in the next seven years, canneries would virtually cover the country side.

Mr. Salisbury is an eloquent speaker and his highly informative and interesting talk was very much enjoyed by all present. A. J. Watson, on behalf of the Branch and guests, moved a hearty vote of thanks to Mr. Salisbury for his address. This was endorsed by all present.

Montreal

Arrangements have been completed for the annual Branch dance which will be held in the main Ballroom of the Mount Royal Hotel on the evening of February the 11th, 1949. Maurice Meerte's and Julio Reyes' orchestras have been engaged and will provide continuous music between 9.30 p.m. to 1.30 a.m.

A bar will be set up in the nearby Brittany Room, and refreshments will be served during the evening in the form of a buffet supper.

Dress will be optional.

Tickets will be placed on sale early in January and will be available at Headquarters and from members of the Entertainment Committee.

It is hoped that the dance will prove to be as successful as last year's at which some 600 members and their friends attended and enjoyed a very excellent party. The arrangements for this year's party have been carried out by Mr. R. Hobner and his committee with the able assistance of the Ladies Committee under the chairmanship of Mrs. I. R. Tait.

Junior Section

Leo Scharry, Jr.E.I.C.
Secretary-Treasurer

Throughout the year the Executive has noticed an increased interest on the part of the membership. Still, in general we must honestly admit that the attendance at the regular Monday meetings, though more numerous than the previous years, still will have to be stimulated so that more may reap the benefits of the efforts of your Executive. Social events such as Opening Night, Ladies' Film Nights, Oyster Party, and the Dance, are always overwhelming successes.

On November 29, the Section secretary, Léo Scharry, gave a talk on his recent trip to Mexico where he attended the 64th General Summer Convention of the American Institute of Electrical Engineers. The main contrasts and particularly native habits and customs, ranging from the cost of living to bull-fights, were explained both by Mr. Scharry and by a 45-minute English-speaking technicolor film loaned by the Mexican Government. A few exhibits were also on hand to demonstrate some of the native handicrafts such as blankets, tablecloths, serapes, etc.

The biggest dance ever arranged by the Junior Section was held on December 3 at the Ritz-Carlton Hotel. Over 650 persons were present and danced to the music of two orchestras. Plans are already being made for next year's dance which will be the fifth.

On December 13, Mr. L. J. Davignon, assistant general manager of the Banque Canadienne Nationale, in a highly educational talk, spoke on the **Services of a Bank.** Talks of this nature, though they seem non-technical, are for engineers a part of their training which is not usually dwelt upon in college curricula. This talk ended the 1948 activities.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

Sixty or more members and friends of the Niagara Peninsula Branch gathered for the November meeting at the recreation hall of the Horton Steel Company, at Fort Erie, Ontario.

An excellent turkey dinner was served

by a ladies' church group of Fort Erie.

Chairman W. A. Coombes called on W. R. Manock, president of the Horton Steel Co., who introduced Mr. H. C. Boardman, director of research for the Chicago Bridge and Iron Works. Mr. Boardman spoke on **Multispheres and Serrated Tanks.**

The subject was illustrated with slides and under the clear exposition of the speaker it became one of intense interest. A serrated tank is one of cylindrical, spheroidal or spherical shape with inner and outer skin plates, which are separated from each other by an annular space divided into segments by radial diaphragms connecting the vertical edges of the inner and outer skin plates. The plates of the inner skin are made flat and they form chords to the general circle of the tank. The outer plates are curved to a much smaller radius than the general radius of the tank as a whole, which gives the tank the serrated or pumpkin shell appearance. The important feature of this construction is that the size of a tank can be increased to an almost unlimited degree without unduly increasing the thickness of the skin plates. The inner plates are not welded along their horizontal edges, which results in a substantial reduction in welding cost.

Following the address and discussion period, past chairman M. F. Ker extended the thanks of the members to Mr. Boardman, and also to Mr. Manock and the Horton Steel Company for their kind hospitality. A number of members were conducted on a tour of the plant after the meeting.

At the executive meeting a new routine of operation was proposed by vice-chairman A. L. Asplin as to responsibility for programme arrangement. The suggestion was adopted and under the new arrangement the whole executive becomes the programme committee. It is divided into several groups each of which is responsible for one meeting of the year. In this way it is hoped to gain a wider interest and a better coverage of the interest fields of all the members. The committee will act under the chairmanship of the branch vice-chairman, whose duty it will be to integrate the activities of the sub-groups.

Ottawa

C. G. Biesenthal, m.e.i.c.
Secretary-Treasurer

R. C. Purser, m.e.i.c.
Branch News Editor

It is to the school children of today —the drivers of tomorrow—that the Ontario Department of Highways is paying most attention in its efforts to teach safe habits of driving, Deputy Minister J. D. Millar told members of the Ottawa branch of the Institute at their luncheon on October 28. Youngsters not only learn for the future but are able to teach their parents correct habits.

It is thanks to many safety organizations as well as the press that "a tremendous job is being done in backing the safety campaign". Mr. Millar said construction and maintenance of roads, education in safety and enforcement of laws were the four fields for promotion of safety on the highways.

In the Queen Elizabeth highway (Toronto to Hamilton), Ontario can boast of a road that "takes a back seat to no other on the continent". It is the busiest highway in Canada with a peak of 20,000 vehicles a day, yet has been the scene of only three fatal accidents in the nine years since it was opened.

Ontario also has more winter maintenance of roads than any other part of the world, was the first to use "symbol" road markings to replace worded signs, and is the only province or state on the continent using 12-inch red lamp signals, which can be seen as far as 12 miles ahead by car drivers.

The speaker was introduced by Walter Saunders, divisional engineer of the Department of Highways, and thanked by chairman J. L. Shearer. Head table guests were: Mr. Saunders; A. K. Hay, chief engineer of the Federal District Commission; and the following members of the Ottawa Suburban Roads Commission A. H. Fitzsimmons, A. E. Stephens, Harold Kidd, N. B. MacRostie.

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Britain's greatest and most plentiful resource is skill, with supplies of raw material and machinery down to a minimum, G. C. Monture, O.B.E., of Ottawa, told members of the Ottawa branches of the Engineering Institute and Canadian Institute of Mining and Metallurgy at luncheon November 18, at the Chateau Laurier.

Recently returned from Britain, Mr. Monture remarked manufacturers and scientists are working together in close co-operation in an attempt "to ensure that the product leaving the plant is the best that the craftsman and scientist can produce". He had been impressed with the type and thoroughness of research work being carried on in Britain and "the extent to which the manufacturing industries rely on the results of research work, and strict technical control employed".

The "grey market" in Britain and other European countries represents "a decline in moral and ethical values of the people". Mr. Monture described a visit to a British restaurant where items which did not appear on the menu could be obtained for an extra charge.

Food was the main topic of conversation replacing the popular subjects of, "sex and liquor", the speaker said. "No one actually is going hungry. The ration policy of the present government has resulted in a fine-looking group of young people from infancy to primary school age. In general, the good health of the people is attributed to their diet".

Mr. Monture was introduced by K. G. Chipman and thanked by the chairman J. L. Shearer. Head table guests included Dr. Charles Camsell, W. B. Timm, director of Mines, Forests and Scientific Services, John McLeish, past director of Mines and Geology branch; V. C. Wansborough, secretary, Canadian Metal and Mining Association and W. S. Lecky.

Saguenay

T. T. Anderson, Jr.E.I.C.
Secretary-Treasurer

Junior Section

T. H. Duffy, m.e.i.c.
Secretary-Treasurer

A meeting of the Junior Section of the Saguenay Branch was held at the Arvida Protestant School on December 6th.

This was the annual meeting for elections of officers, and Film Night.

The retiring chairman, C. J. Tanner, gave a review of the year's activities in the Junior Section, and reports of the secretary-treasurer were read and approved. Elections of officers for the 1948-1949 season were held, with the following results: T. T. Anderson is chairman; F. H. Duffy, vice-chairman; W. Dayton, secretary-treasurer; K. H. Cram and H. E. Marshall are committee members.

Following the elections, the following films were shown:

"Arc Welding at Work", "The Story of FM", and "Light". They proved very interesting.

Saskatchewan

D. W. Houston, m.e.i.c.
Secretary-Treasurer

R. Bing-Wo, m.e.i.c.
Branch News Editor

Regina Section

An informal meeting of the branch was held in the Canadian Room of the Hotel Saskatchewan on November 10, 1948. The speaker was Mr. G. K. Bell, Chairman of the Association of Consulting Engineers of Great Britain. Stewart Young, chairman of the Branch, presided, and the guest speaker was introduced by Mr. W. G. Coventry, British Trade Commissioner for the Prairie Provinces.

Mr. Bell is en route to Brazil and travelling through Canada to explore the possibility of the use of British engineering services, materials and equipment in Canada. He expressed a very optimistic opinion of the possibility of the use of British engineering in the Canadian West.

A discussion period followed and a large number of questions were answered by Mr. Bell, ranging from engineering standardization to labour problems.

M. J. Spratt tendered the vote of thanks to the guest speaker.

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A special meeting was called on November 19 at the Kitchener Hotel. The main purpose in calling the meeting was to discuss fully the new Dominion Labour Bill 195, and its effect on the engineering profession.

A great deal of discussion on collective bargaining and its ramifications was carried on. The final result was that the members present went on record as favouring exclusion from the operations of the new bill, of all registered members of the profession and all engineers-in-training. In order to gain the opinion of members throughout the Province a motion was passed directing that a letter ballot be taken on the matter before official action be taken.

Saskatoon Section

J. B. Mantle, m.e.i.c.
Secretary

On October 29, the Saskatoon Section held an informal meeting in the Engineering building of the University with P. C. Perry, m.e.i.c., district engineer of the Canadian National Railways presenting an intensely interesting paper **Precipitation — Evaporation Relationship**

for the Canadian Prairie. Mr. Perry has made a thorough study of the subject and by correlating Government data on average temperatures and precipitation has been able to define moisture-deficient areas of the West within fairly close limits. A moisture-deficient locality is one having a lower rate of precipitation than evaporation. Records indicate that 18 or 19 inches of moisture is the requirement for our warmest areas and this figure was used as a basis.

Mr. Perry had prepared several charts, one of the most striking of these being a plot of temperature against precipitation and evaporation. Knowing the average temperature of a locality, this curve foretells the annual precipitation requirement for a satisfactory precipitation balance. The importance of engineers, conservationists, and citizens recognizing and understanding the true moisture conditions of the prairies was stressed. The paper was followed by a spirited discussion session which was evidence of the interest of those present. The speaker was introduced by A. B. Olson and a well-deserved vote of thanks was moved by Clarence Forsberg.

Other events during the evening included a film on the electron microscope, "Unseen Worlds", from the National Film Board; and a film, made in Switzerland, dealing with the manufacture of Wild Surveying instruments, courtesy of the Western Drafting and Blueprinting Company.

The problem of Bill 195 and its effect on engineers was fully discussed, both students and practising engineers giving their views. The unanimous opinion of the group favoured exclusion of engineers from the provisions of the bill.

Do-nuts and coffee in the "common room" concluded a very satisfactory meeting.

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On November 17, the Saskatoon Section held a dinner meeting followed by a conducted tour of the Saskatchewan Government Telephone's local exchange. Ninety-two engineers took advantage of this opportunity to explore the "brain" of the telephone system. The telephone company's employees were on hand in full force to insure a well-conducted and thorough plant visit. Much credit is due to superintendent Medhurst, his supervisors and other staff members for the marvelous way in which the tour was organized. Everyone was able to see and to absorb a maximum of interesting information. Highlighted were such things as the free long distance telephone calls, the carrier equipment, the museum of old-time telephone equipment, the extensive test equipment and trouble warning systems, how the telephone pay station works, and last, but not least, the smart appearance of the "number please" lasses.

At the dinner, prior to the visit, a film "Telephone Courtesies" was viewed and was very much appreciated. The film, showing "what to do" and "what not to do" with your telephone, was presented in a colourful and humourous way. Mr. Wickware, methods engineer with the Saskatchewan Government Telephones at Regina, was present to introduce the film. Chairman Douglas extended a warm welcome to the many student members present and introduced head table guests Lovell, Wickware, Tubby, Friebel and Carroll.

St. Maurice Valley

G. W. Ince, s.e.i.c.
Secretary-Treasurer

J. G. MacLeod, m.e.i.c.
Branch News Editor

The third meeting of this Branch for the 1948-49 season featured a dinner meeting in Three Rivers, with Paul Brault of Dominion Bridge Company as guest speaker. The Mayors of Three Rivers and Cap de la Madeleine spoke briefly of the role of engineers and their contribution to the St. Maurice Valley.

Mr. Brault presented a very thorough and detailed description of the structural steel design and construction of the Duplessis Bridge in Three Rivers. His talk was illustrated throughout with lantern slides of interesting design features and photographs of the actual construction.

This bridge replaced the two old highway bridges across the St. Maurice River between Three Rivers and Cap de la Madeleine. It is of continuous girder construction over two crossings and cost some three million dollars. The East crossing is 635 ft. 4 in. long over 5 spans and the West crossing is 1375 ft. 4 in. over 8 spans. It is interesting to note that the 180-ft. span of this bridge is probably the longest on this continent for this type of bridge, and that all girder field splices were welded.

The speaker traced the design of the bridge in detail and indicated the amount of work required to obtain the final design, stress sheets, and templates. He also told of the particular construction problems encountered and the means used to overcome them.

A number of questions followed the talk and the speaker, who had been introduced by S. E. Williams of Three Rivers, was thanked by V. Jepsen of Grand' Mere.

Toronto

R. A. Muller, jr.e.i.c.
Secretary-Treasurer

M. W. Huggins, m.e.i.c.
Branch News Editor

Robert F. Legget, director of the Division of Building Research of the National Research Council addressed the November meeting of the Toronto Branch on Thursday, November 24th, 1948 in the Physics Bldg., University of Toronto. The audience of over 200 persons included many architects and students of the University as well as engineers.

NATIONAL RESEARCH COUNCIL

Speaking on the subject **Developments in Building Research,** Mr. Leggett traced the evolution of the N.R.C. as it functions today from the Honorary Advisory Council for Scientific and Industrial Research set up in 1916. The original council of twenty scientists and engineers functioned as a purely advisory body to the government on scientific and engineering matters. The present staff of the Council totals about 2500.

BUILDING RESEARCH DEVELOPMENT

Turning to the development of building research, Mr. Legget pointed out that with the exception of Great Britain, which has had a Building Research Station since 1921, the instigation of building research in other countries is of quite recent date, averaging about two years. In Canada the Division of Building Research and the Central Mortgage and Housing Corporation were both started on August 1st, 1947. Mr. Legget stressed that his division will not limit its investigations to housing but will study problems relating to any part of the building industry.

RESEARCH ON DOMINION-WIDE BASIS

Pointing out that Canadian climate comprises at least five distinct types, each of which entails its own building problems, the speaker stressed the Division's determination to carry out much of the necessary research right on the construction job. Mr. Legget hopes that the Division of Building Research will be advised of any unusual construction problems encountered during the progress of the work so that research officers may have an opportunity to study these problems for the benefit of the building industry as a whole.

PROGRAMME OF THE DIVISION

The first task will be the collating of the results of research already carried out and the organization of this material in a form readily available to the building industry.

In an effort to reach the individual builder, who spent such a large proportion of last year's one billion dollar expenditure on Canadian Construction, the Division plans to publish non-technical pamphlets.

HOUSING RESEARCH UNDER WAY

Housing research now under way includes a study to determine the where and why of heat losses. Knowledge thus gained of heat losses will be applied to a study of the desirability of building houses without basements. These would rest on a concrete slab laid on a foundation free from capillary moisture. Mr. Legget mentioned the numerous problems raised by the elimination of the basement and indicated that studies would be made in this connection to determine whether or not the overall picture indicates an economic advantage in this type of housing.

NATIONAL BUILDING CODE

The National Building Code of Canada is considered by some countries to be the finest yet produced anywhere. However, the Code is not a static document but is subject to constant revision and the next edition of the code will be issued in loose leaf form. A committee was appointed early in November to produce the revised Code.

The Soil Research laboratory has several studies under way including one on soil temperature variations. Work has also been started on materials of construction. The address was concluded with some slides illustrating work under way in other countries relating to building research.

Professor M. W. Huggins thanked the speaker on behalf of the Toronto Branch.

(Branch News is continued on page 60)

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

JUNIOR CHEMICAL ENGINEER required by independent oil company located in Turner Valley. Duties will include design and supervision of maintenance and new construction work. Advancement will depend on initiative and readiness to assume responsibility. Salary open. Apply to File No. 1075-V.

CHEMICAL ENGINEER age 25 to 35 years, preferably with some experience in a rubber factory required by manufacturer in Province of Quebec to take charge of the laboratory and as soon as capable assume duties of plant engineer. Salary open. Apply to File No. 1077-V.

ELECTRICAL

ELECTRICAL DESIGNING DRAUGHTSMAN for work in Southern Ontario. Must be experienced. Salary up to $300. Apply to File No. 1059-V.

ELECTRICAL ENGINEER required as assistant to electrical superintendent by a textile manufacturing concern in Montreal. Applicant must have had good experience and be willing to accept responsibility. Salary open. Apply to File No. 1070-V.

RECENT GRADUATE, electrical background required as sales engineer by a manufacturer in Montreal. Salary open. Apply to File No. 1071-V.

ELECTRICAL ENGINEER with industrial background preferably pulp and paper required for senior position in electrical department of a paper mill in the Ottawa Valley. Salary open. Apply to File No. 1073-V.

ELECTRONICS ENGINEER and Technicians experienced on design and construction of radar, servomechanisms, computors or magnetometers required for development laboratory specializing in airborne devices for aerial survey and navigation. Advancement in rapidly expanding and progressive organization assured for capable personnel. Salary open. Apply to File No. 1074-V.

RECENT GRADUATE in Electrical Engineering required for Sales Engineering Work with old established Montreal firm. Must have had at least two years practical experience and be willing to travel occasionally. Apply to File No. 1094-V.

MECHANICAL

MECHANICAL ENGINEER with two or three years experience in chemical or allied industries required by chemical plant in Central Ontario. Salary open. Apply to File No. 1066-V.

MECHANICAL ENGINEER required as assistant to mechanical superintendent by a textile concern 35 miles south-west of Montreal. Must have had good experience and willing to accept responsibility. Salary open. Apply to File No. 1070-V.

MECHANICAL ENGINEER, experienced on design and construction of fine instruments wanted to take charge of small model shop in laboratory specializing on development of airborne radar and aerial survey and navigation aids, servomechanisms and computors. Advancement in rapidly expanding and progressive organization assured for capable engineer. Salary open. Apply to File No. 1074-V.

MECHANICAL ENGINEER required by an established manufacturing company in Toronto to layout and plan new building in the Toronto area. Opportunity for permanent employment. Reply stating age and experience. If possible attach a recent photograph. Salary open. Apply to File No. 1079-V.

MISCELLANEOUS

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experience in installations of production and cost control. Wage incentives ,etc. Free to travel. Preferably bilingual. Salary open. Apply to File No. 1058-V.

SALES ENGINEER 24 to 30 years of age, preferably single and free to travel required by Canadian manufacturer of industrial rubber products. Must have a minimum of 1 to 2 years post-graduate experience in mining or plant maintenance. Salary open. Apply to File No. 1060-V.

SENIOR ENGINEER required by Montreal contractor to supervise engineering and power development work in Ottawa area. Salary $425.00 up. Apply to File No. 1062-V.

INDUSTRIAL ENGINEER preferably with mechanical or chemical background and some experience in industrial engineering work, including plant layout and time study required by chemical company in Toronto. Apply to File No. 1065-V.

RECENT GRADUATE preferably mechanical or electrical background required by National Beverage Company. Training period in Montreal. Salary open. Apply to File No. 1069-V.

SALES ENGINEER required for sales staff of a manufacturer in Toronto. Preferably background in Mechanical, Chemical or Mining engineering. Salary open. Apply to File No. 1076-V.

SENIOR TIME STUDY MEN required by large National Organization in Ontario. Must be competent in methods improvement and have experience in developing standard data on machine tool and other operations. Salary open. Apply to File No. 1078-V.

JUNIOR ENGINEER OR ARCHITECTURAL DRAUGHTSMAN for city planning office in Western Canada. State education, experience, age and salary desired. Apply to File No. 1080-V.

GRADUATE CIVIL ENGINEER or ARCHITECT required for Saskatchewan community, about 6,000 population, to act as town planner under consultant, and as assistant to City Engineer. Interest in civic problems desirable. State education, experience and age. Apply to File No. 1080-V.

INDUSTRIAL ENGINEERS, must be fluently bilingual, two residents of Quebec City, one Bois Franc Region, one Grand'Mere, five Montreal, wanted by New York firm of Management Consultants, members of American Management Association contemplating to organize a branch in the Province of Quebec. Salary, commission and travelling expenses. Apply to File No. 1083-V.

JUNIOR SALES ENGINEER, preferably bilingual, to be trained for sales work with Montreal Industrial Company. Salary open. Apply to File No. 1086-V.

The following advertisements are reprinted from last month's Journal, having not yet been filled.

CHEMICAL

JUNIOR RESEARCH CHEMIST required by a manufacturer in Central Ontario to be trained in Research work. Salary open. Apply to File No. 1017-V.

CHEMICAL ENGINEER, recent graduate, is needed for production work by chemical manufacturing firm situated in the Province of Quebec. Some experience in chemical production of synthetic resin manufacture would be advantageous. Salary open. Apply to File No. 1064-V.

CIVIL

CIVIL ENGINEER to act as assistant to Senior Officer of a well-established general contracting firm in Montreal. Applicant should have about five years experience and have some knowledge of all phases of building construction. Salary open. Apply to File No. 1038-V.

CIVIL ENGINEER required for Consulting Engineers office in Western Canada. Must have extensive experience water, sewer and pavement layouts capable of taking charge office staff and field parties. Partnership offered to right man. Salary open. Apply to File No. 1042-V.

CIVIL ENGINEERING GRADUATES with several years experience in building construction and estimating for permanent senior and junior positions in Winnipeg. Good prospects and pension benefits. Starting salary $250.00 and up per month with yearly increments. Apply to File No. 1061-V.

ELECTRICAL

ELECTRICAL ENGINEER with at least five years experience in Central Station and Substation installation and maintenance required by a Maritime Public Utility. Apply to File No. 1043-V.

MECHANICAL

MECHANICAL ENGINEER required by a large industrial concern in the Province of Quebec. Good chances for advancement. Salary open. Apply to File No. 1014-V.

MECHANICAL ENGINEER required by a large industrial plant in the East end of Montreal for product design work on major electrical appliances. We are prepared to offer definite advancement in a reasonably short period of time and salary will be based on potentiality rather than experience. Apply to File No. 1016-V.

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 1029-V.

MECHANICAL ENGINEER recent graduate, required for Engineering Department of a farm implement manufacturer in Ontario. Salary open. Apply to File No. 1030-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary colliery plant, screening equipment, hoists, simple steel structures, etc. Salary $240 up depending upon ability. Apply to File No. 1032-V.

MECHANICAL ENGINEER preferably with a few years experience and some knowledge of pulp and paper required for design and layout by a company in New Brunswick. Salary open. Apply to File No. 1036-V.

SENIOR MECHANICAL DRAUGHTSMAN required by a machinery manufacturer in Central Ontario. Salary open. Apply to File No. 1044-V.

SENIOR MECHANICAL DRAUGHTSMAN for work in Ottawa. Ten years experience required in simple design layout and detail drawings for steam power plants, steam and hot water heating, ventilation and air conditioning. Four year contract if suitable. Reply in confidence, outlining experience and stating salary expected. Apply to File No. 1045-V.

MECHANICAL ENGINEER with industrial background required as sales engineer by consulting firm in Montreal. Salary $300 up according to experience. Apply to File No. 1049-V.

MECHANICAL ENGINEER thoroughly experienced in machine design with some background and experience in the printing trades required as methods engineer by manufacturer in Ontario. Must also have knowledge of production problems. Salary open. Apply to File No. 1050-V.

MECHANICAL ENGINEER with 5 or more years experience in industry, preferably pulp and paper required by manufacturer in Province of Quebec for duties involving organization of improvements, job schedules, machinery maintenance and some mechanical draughting. Salary $300-$350. Apply to File No. 1052-V.

METALLURGICAL

RECENT GRADUATES in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 1029-V.

MISCELLANEOUS

SALES ENGINEER required by Company manufacturing electrical switchgear, to represent them in Alberta and Sask. Salary and commission. A man with an aggressive personality and experience in this line of product can assure himself of a good income. Apply to File No 1018-V.

SALES ENGINEER, recent graduate, mechanical background, required by Canadian manufacturer. Must be free to travel. Location Ontario. Salary $235. to $250. Apply to File No. 1019-V.

GRADUATE ENGINEER, preferably mechanical or chemical, required for sales engineering in the Toronto area. Should have some experience in sales and maintenance engineering. Salary open. Apply to File No. 1020-V.

MECHANICAL OR ELECTRICAL ENGINEER age about 35 years with experience in building construction and machinery, maintenance and repair, capable of taking over the engineering and maintenance service in a large textile mill in Province of Quebec. Salary open. Apply to File No. 1021-V.

SENIOR INDUSTRIAL ENGINEER required by firm in Province of Quebec. Duties include: Wage incentives, method studies, cost reduction, etc. Should be graduate in mining or mechanical engineering. Salary open. Apply to File No. 1023-V.

GRADUATE ENGINEER mechanical or electrical background required to set up and organize a new department for a Canadian manufacturer. Must have plant and production experience. Preferably under 35 years. Salary open. Apply to File No. 1025-V.

FORESTRY ENGINEERS, recent graduates also class of 1949 required for extensive logging operations in Province of Quebec. Preferably but not necessarily bilingual. Current salaries paid. Apply to File No. 1026-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 1027-V.

GRADUATE ENGINEERS with mechanical and light structural experience, applicable to designing and detailing of conveyors, who are interested in establishing themselves with a well established growing concern to learn business in preparation for future advancement. Situated near Toronto. Salary open. Apply to File No. 1028-V.

JUNIOR ENGINEER preferably with civil background required for sales and service by a Montreal manufacturer of water-proofing compounds. Salary open. Apply to File No. 1033-V.

SALES ENGINEER under 35 years of age, preferably with engineering and sales experience required in Toronto, to become a specialist in capacitor sales. Salary according to qualifications and experience. Apply to File No. 1035-V.

GRADUATE ENGINEER with engineering and sales experience required as a Street lighting specialist in Toronto area. Position involves direct sales engineering with municipalities and utilities also engineering and production problems, directly concerned with the manufacture of street lighting equipment. Age under 35 years. Salary open. Apply to File No. 1035-V.

SALES ENGINEERS, one experienced man, also two juniors, willing to learn required by an electrical and power house equipment manufacturer in Montreal. Salary open. Apply to File No. 1035-V.

CONCRETE DESIGNERS with experience and preferably under 35 years of age required by construction company in Montreal. Salary open. Apply to File No. 1037-V.

MECHANICAL OR ELECTRICAL ENGINEER required as Montreal representative of a Canadian manufacturer with Headquarters in Ontario. Preferably some sales experience. Salary open. Apply to File No. 1039-V.

JUNIOR ENGINEER preferably with a few years experience required by Construction Company in Montreal. Salary open. Apply to File No. 1040-V.

GRADUATE ENGINEER for urban transportation system 25 to 40 years of age with at least five years experience. Hydro-Elect. plant operation experience essential. Steam or diesel electric generating plants desirable. A knowledge of time and motion study and evaluation would be a definite advantage. Salary open. Please send photograph and full particulars of education and experience. Apply to File No. 1041-V.

FOREIGN TRADE REPRESENTATIVE for Middle and Far East for one of Canada's largest chemical manufacturers. Must have extensive experience and knowledge in establishing important contacts in overseas markets. Canadian citizen. Knowledge of French. Salary $8,000 up. Apply to File No. 1046-V.

GRADUATE ENGINEER required by a consulting engineer in Montreal. Must have experience in boiler plant design and general knowledge of heating. Salary open. Apply to File No. 1048-V.

DRAUGHTSMAN required by industrial organization in Toronto. Must have plant and structural experience. Salary open. Apply to File No. 1051-V.

MECHANICAL OR CIVIL ENGINEER with 3 or more years experience in industry, preferably pulp and paper required by a manufacturer in Province of Quebec for duties involving study and preparation of improvement projects, such as, installation of machinery, piping, etc. Salary $250 to $300. Apply to File No. 1052-V.

MINING OR METALLURGICAL ENGINEER capable of taking charge of a plant control laboratory for plant and control work, required by a manufacturer in the St. Maurice Valley. Age should be between 30 to 40 years. Salary open. Apply to File No. 1054-V.

GRADUATE ENGINEERS required for sales staff of a manufacturer in Montreal. Preferably background in mechanical, chemical or mining engineering. Permanent position and good salary for right man. Apply to File No. 1057-V.

DESIGN ENGINEER for concrete machinery and mixers required by well established Ontario manufacturing company. Good opportunity. Good salary. Apply to File No. 1067-V.

ASSISTANT PLANT ENGINEER required for textile plant in Montreal. Age 27 to 35 and must have maintenance experience. Salary open. Apply to File No. 1068-V.

Situations Wanted

MECHANICAL ENGINEER, age 39, experienced in tool design and production methods, material selection, production records, control and co-ordination. Desires employment preferably in Montreal with either manufacturer or firm of Engineers who could utilize all or a part of above experience. Apply to File No. 551-W.

ELECTRICAL ENGINEER, Jr.E.I.C., Manitoba, '44, married, age 27. Presently situated in Maritimes desires active position in Central or Western region. Field service engineering, C.G.E. test course, Army radar experience. Interested in plant engineering, installation or development openings. Apply to File No. 846-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Sc. (E.E.) Manitoba, 1943. Age, 27. Married. Electrical experience with R. C. Signals and 2½ years general electrical experience in industry. Sales training. Presently employed but desires position offering wider scope and opportunity. Preferably Montreal area. Apply to File No. 925-W.

GRADUATE MECHANICAL ENGINEER (McGill) M.E.I.C., P.Eng. Ont. 26 years experience including Oil refinery design, plant layout, structural design, pressure vessels, central station boilers and furnaces both design and specifications; surveys and reports on power plant and factory efficiency problems, inspection of installations, and supervision of maintenance on heating, ventilation and air conditioning of military and Air Port buildings, and fuel storage depots. War veteran, employed but desires renumerative responsible position on West Coast. Would consider partnership with Consulting firm. Apply to File No. 991-W.

STRUCTURAL ENGINEER, M.E.I.C., P. Eng., experienced in design work and preparation of drawings for wood, structural steel, and reinforced concrete structures. Interested in position or partnership with consulting engineering firm in Toronto, Hamilton, any other city in the interlake region, or Vancouver. Apply to File No. 1031-W.

ENGINEER, M.E.I.C. Graduate Civil and Electrical. Age 40, single. Experience covers engineering and building construction and maintenance, works maintenance, general and heavy construction machinery sales and service, shop management. Past seven years in executive and administrative capacity. Seek wider opportunities or position leading to same in business, engineering, or business engineering. Free to travel, any location including foreign, available one month notice. Apply to File No. 1266-W.

CIVIL ENGINEER, S.E.I.C., P.Eng. Que. B.Sc. doing post graduate study in Montreal requires part time employment preferably weekends at home. Experienced in various steel plate construction designs. Will also accept draughting and miscellaneous engineering work. Apply to File No. 1487-W.

SENIOR MECHANICAL ENGINEER, M.E.I.C., B.Eng., McGill '34, desires responsible position with a future. Presently employed with firm of chemical consulting engineers. Previous experience includes several years in charge of airplane design, planning, cost estimating and construction. Accustomed to directing technical staff and shop operations. Apply to File No. 1511-W.

GRADUATE ELECTRICAL ENGINEER, M.E.I.C., age 31, with seven years experience in electronics and radio, including radar and microwave techniques, and three years experience in industrial and utility engineering and management, desires permanent, responsible position Montreal, Ottawa, Toronto region preferred. Apply to File No. 1689-W.

SALES ENGINEER, B.E. (Electrical) N.S.T.C., M.E.I.C., Professional Engineer Nova Scotia, age 35, married. Presently employed in Halifax. Ten years experience successfully selling, and supervising the selling of, a variety of electrical equipment. Excellent contacts in Maritime Provinces and Newfoundland. Interested in position as branch manager, or district representative in Maritimes, on salary and commission. Would also consider being manufacturer's agent. Apply to File No. 1758-W.

CHEMICAL ENGINEER, M.E.I.C., Graduate of McGill. Age 33, married, bilingual, presently located in Montreal, experienced in production and process control of dairy equipment, aluminum plant pot-rooms, gas scrubbing plant. Last three years in charge of lubricant and fuel oil sales in marketing organization of major oil company. Desires responsible position with well established firm leading to management. Apply to File No. 1932-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Que., has structural, mechanical, chemical and mining experience. Qualifications merit consideration for responsible position, contract work on design, associate with consulting engineer. Location is Montreal but would locate elsewhere. Interests are structural design, mechanical trades for builidings, power development, steam plant, process plant design, machine and tool design, pulp and paper plant engineering and engineering research. Would consider position as resident engineer, or municipal engineer. Apply to File No. 1935-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Ontario, age 38, married. 14 years extensive structural experience in reinforced concrete and structural steel design and layout. Interested in association with well established progressive organization as Engineering Assistant or Chief Draughtsman. Present salary $5,000. Apply to File No. 2049-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C., Background of Engineering, production, Business Organization, Cost Control, and Management. Age 37, married, and preference for permanent association with enterprize in Montreal area. Apply to File No. 2228-W.

CIVIL ENGINEER, Jr.E.I.C., McGill, '45, married, with experience in surveying and construction. Presently employed with small construction concern in the preparation of estimates, records and cost analyses. Experienced in writing contracts and specifications. Bilingual. Seeking responsible position in Montreal or Ottawa areas. Apply to File No. 2405-W.

MECHANICAL ENGINEER, Jr.E.I.C., P. Eng., McGill '46, age 24, single. Presently employed as a machinist with a large concern. Employment in the past includes positions in tool design, air conditioning and methods engineering. Seeks responsible position with firm in production or shop management. Available on short notice. Apply to File No. 2707-W.

MECHANICAL ENGINEER, Jr.E.I.C., Sask. '46, P.Eng., Ont. Age 23. Married. Experience primarily in Pulp and Paper Industry in maintenance engineering, layouts and small construction jobs. Earnestly desires to enter Industrial Engineering field either with Consulting Engineer of Industrial Methods or Production Department. Location immaterial, available experience most important. Available on one month's notice. Apply to File No. 2795-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44, 7 years industrial experience. Welding application and metallurgy, production supervision, production specifications, purchasing, wage incentives, time study, estimating, costing, design. Available 4 weeks notice. Apply to File No. 2920-W.

CHEMICAL ENGINEER. M.E.I.C., P.Eng., with considerable mechanical experience in plant construction, piping layouts and welding, 14 years industrial practice on positions of responsibility, desire a change of employment preferably in Montreal area. Bilingual. Apply to File No. 2940-W.

GRADUATE ENGINEER, S.E.I.C., Man. '47. Presently engaged in plant layout and field supervision. Experienced in mechanical and electrical construction and maintenance. Responsible position desired in business and production engineering in progressive firm. Apply to File No. 2975-W.

GRADUATE ELECTRICAL ENGINEER, M.E.I.C., P.Eng., Alberta, B.Sc. (Honors) Alberta, M.A.Sc. at Toronto. Married, age 25, 3 years experience in electric power utilization, some generation and distribution; 2 years as officer in electrical branch, R.C.N.V.R., supervision of electrical installations by civilian electricians. Particularly interested in permanent position in Western Canada. Available on one month notice. Apply to File No. 3050-W.

SALES ENGINEER, M.E.I.C., P.Eng.,N.S. and P.Q., B.Sc. Married, age 44, 7 years railway construction, 8 years sales manager large gas and electric utility, 5 years R.C.N.V.R., 5 years naval architect. Desirous of moving to South America, wishes position as sale representative preferably with manufacturer of marine equipment. Apply to File No. 3057-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. Que. G.I.Mech.E.; A.M.I.Loco. E. (Great Britain). Aged 30. Married, 6 years Locomotive design and Construction, machine shop production and assembly. 5½ years Engineer officer, Royal Air Force, rank Squadron Leader, Chief Technical Officer. Employed 18 months in Province of Quebec. Desires change to position with more responsibility and opportunity for advancement. Preferably Southern Ontario or Western Canada. Apply to File No. 3059-W.

MECHANICAL ENGINEER, S.E.I.C., B.A.Sc., Toronto, age 26, single, experience in operation planning and detailing also sales. Presently employed with Importers as Correspondent and Interpreter. Languages: English and German perfect; French reading knowledge only. Desires employment as industrial engineer, preferably in Toronto area. Apply to File No. 3065-W.

SALES ENGINEER, S.E.I.C., recent graduate in Mech. Eng., N.S.T.C. At present very successful N.S. representative of Non-Engineering Organization, also desires to represent Engineering firm as well, part time or full time. Apply to File No. 3068-W.

MECHANICAL ENGINEER, A.M.I. Mech. E., P.Eng. Que. Graduate London 1935; age 37, married. 10 years experience in design, testing and installation supervision of all classes of I.C. engines, supercharging, steam machinery and plant layout in the U.K. 3 years technical executive and administrative experience in policy and production with responsibility of Government level Trilingual, English, German, Russian. Desires responsible position covering design, administrative or sales with progressive and reliable employers, anywhere in Canada. At present resident in Montreal. Apply to File No. 3069-W.

PART TIME WORK, Graduate Civil Engineer, B.A.Sc., Jr.E.I.C., now doing graduate work in Montreal. Desirous of obtaining part time work in concrete and steel design or cost estimating. Apply to File No. 3073-W.

GRADUATE MECHANICAL ENGINEER, 39, single, 14 years experience in research engineering, instrumentation, automatic controls, testing of materials and machinery. Knowledge of metallography, heat-treatment, and welding. Several languages. Acquainted with optical and electrical equipment, emergency maintenance of plant and motor transport. Desires suitable position requiring initiative. Apply to File No. 3074-W.

PART TIME WORK, 3rd Year Electrical Engineer, McGill S.E.I.C. Anxious to obtain part-time employment, preferably in electrical field. Have considerable free time available. Summer experience in textile plant also telegraph department of railroad company. Apply to File No. 3075-W.

MECHANICAL ENGINEERING STUDENT, S.E.I.C., 2nd year at McGill University, member, Society of Motion Picture Engineers, age 21, single. Interested in obtaining summer employment with prospects of permanent position in precision mechanical engineering field (instruments, meters, motion picture equipment). Machine shop experience, languages. Apply to File No. 3076-W.

GRADUATE ENGINEER, Toronto '42, M.E.I.C., P.Eng. (Civil Branch), age 30. Married. Overseas veteran with R.C.E.M.E. Experience in Mining and Metallurgy. Presently engaged in all phases of railroad construction and maintenance of way including estimating, general design and layout work. Desires change to position of professional responsibility in Municipal Engineering or Industrial work in smaller firm. Preferable location Toronto or neighborhood. Now completing two year course in Business Methods. Apply to File No. 3077-W.

CIVIL GRADUATE, S.E.I.C., B.Sc., Queen's. Age 25, married, veteran. Experience limited to survey work and varied shop experience. Desires a position with a consultant or with a town planner. Available on short notice. Apply to File No. 3078-W.

SALES ENGINEER, M.E.I.C. Electrical and Mechanical background, bilingual, 12 years service in Navy and 6 years with Wartime Shipbuilding and War Assets in technical and executive capacity. Interested in representing Firm in Montreal area. Available immediately. Apply to File No. 3081-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Concise Oxford Dictionary of Current English, 3rd ed:
H. W. Fowler and F. G. Fowler. Oxford, Clarendon Press, 1946. 1520 p., cloth.

Consulting Engineer Year Book, 1948:
Princes Press, London, 1948. 228 p., illus., cloth.

Design of Industrial Exhaust Systems, 2nd ed:
John L. Alden. New York, Industrial Press, 1948. 252 p., illus., fabrikoid.

Elasticity and Anelasticity of Metals:
Clarence Zener. Chicago, University of Chicago Press, 1948. 170 p., illus., cloth.

Gas Tables: Thermodynamic Properties of Air, Products of Combustion, and Component Gases; Compressible Flow Functions, including those of Ascher H. Shapiro and Gilbert M. Edelman:
J. H. Keenan and Joseph Kaye. New York, Wiley, 1948. 238 p., illus., cloth.

Introduction to Engineering Problems:
R. Q. Brown. New York, Prentice-Hall, 1948. 191 p., illus., cloth.

Introduction to Gas-Turbine and Jet-Propulsion Design:
C. A. Norman and R. H. Zimmerman. New York, Harper Brothers, 1948. 286 p., illus., cloth.

Machine Design and Drawing Room Problems, 4th ed:
C. D. Albert. New York, Wiley; London, Chapman and Hall, 1948. 519 p., illus., cloth.

Microwaves and Radar Electronics:
E. C. Pollard and J. M. Sturtevant. New York, Wiley; London, Chapman and Hall, 1948. 426 p., illus., cloth.

Packaging Methods and Equipment:
O. W. Roskill & Co. (Reports) Ltd., London, 1948. 57 p., paper.

Principles of Electric and Magnetic Fields:
W. B. Boast. New York, Harper Brothers, 1948. 405 p., illus., cloth.

Tables of Physical and Chemical Constants, and some Mathematical Functions, 10th ed:
G. W. C. Kaye and T. H. Laby. London, New York, Toronto, Longmans Green, 1948. 194 p., illus., cloth.

Physics for Arts and Sciences:
L. G. Hector, H. S. Lein, and C. E. Scouten. Philadelphia, Toronto, Blakiston, 1948. 731 p., illus., cloth.

Radio Engineering, Volume One:
E. K. Sandeman. New York, Wiley, 1948. 775 p., illus., cloth.

Railway Lubrication:
Imperial Oil Limited, Railway Service Engineers, Toronto, 1948, 282 p., illus., fabrikoid.

Technical Writing:
King Hendricks and L. A. Stoddart. Logan, Utah, Utah State Agricultural College, 1948. 117 p., illus., fabrikoid.

LIBRARY REGULATIONS

Hours

	Oct-May	June-Sept
Mon-Fri	9–6	9–5
Thurs (Oct-Mar)	9–8	9–5
Sat (closed Jy-Aug)	9–12	9–12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

Indicate which required
Be specific

Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

Non-members may consult the library, but may not borrow material.

Vacuum Manipulation of Volatile Compounds; a Laboratory Manual Describing the Application of High Vacuum Technique in Experimental Chemistry:
R. T. Sanderson. New York, Wiley; London, Chapman and Hall, 1948. 162 p., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Connecticut Society of Civil Engineers, Inc.:
Annual Report of Proceedings for the Sixty-fourth Year of the Society, ending March 17, 1948.

International Telecommunication and Radio Conferences, Atlantic City:
Final Acts, 1947.

Iron and Steel Institute:
Journal, Volume 154, number 2, 1946.

TECHNICAL BULLETINS, ETC.

Edison Electric Institute. Publications:
No. Q-7—Recommended Procedure for the Diagnosis of Cable, Joint and Termination Failures.

Ingeniors Vetenskaps Akademien. Handlingar:
Nr. 198—Studies on the Middle Lamella of the Flax Fibre, Gosta Lindeberg and P. W. Lange.—Nr 199—Thermal Investigations into Carbonization of Wood, Torsten Widell.

Institution of Electrical Engineers. Proofs:
Waterworks Power-Plant Practice: the Comparative Costs of Steam-, Diesel-, and Electrically-Operated Machinery, T. P. Wakeford.

Institution of Mechanical Engineers. Advance Copies:
Heat Engines, K. Baumann.—Modernization of a Coal-Discharging Depot, G. T. Shoosmith.—Problem of Weight in a Modern Radar Equipment, W. A. Creeth.—Rubber as a Stress-Carrying Material and some Design Considerations, S. W. Marsh.

International Civil Aviation Organization. Publications:
ICAO Regional Manual—North Atlantic (Doc 4500)—Amendment No. 24, November 18, 1948.—ICAO Regional Manual—North Atlantic (Doc 4500)—Amendment No. 25, December 2, 1948.—Procedures for Air Navigation Services—Publications.—Second Assembly, Legal Commission, Minutes and Documents.—Second North Atlantic Regional Air Navigation Meeting—Publications.—Standards and Recommended Practices.

North-East Coast Institution of Engineers and Shipbuilders. Advance Copies:
Ship Structural Members—Part IV, C. J. G. Jensen, with a foreword by J. L. Adam.—Techniques of a Gas Turbine Vibration Laboratory, R. G. Voysey.

Princeton University. Industrial Relations Section. Research Report Series:
No. 78—Company-Wide Understanding of Industrial Relations Policies; a Study in Communications, Helen Baker.

U.S. Bureau of Standards. Building Materials and Structures Reports:
BMS113—Fire Resistance of Structural Clay Tile Partitions.

STANDARDS, SPECIFICATIONS, ETC.

American Institute of Electrical Engineers. Specifications:
AIEE No. 45, Dec. 1948—Recommended Practice for Electric Installations on Shipboard.

American Standards Association. Standards:
ASA Z32.10-1948—Graphical Symbols for Electron Devices.

British Standards Institution. Handbooks:

BS Handbook No. 8-1948—British Standards for the Automobile Industry.

...Codes of Practice:

CP(B) 804—Timber Flooring.

PAMPHLETS, ETC.

Dictionary of House-Building Terms:

Central Mortgage and Housing Corporation, Ottawa, 1948.

Electrodes and Metals:

A. S. Tuttle. Toronto, Canadian Welding Bureau, 1948.

"... Most Desirable Personal Characteristics . . ."; an Exploration of Opinion and a Report from the Subcommittee on Student Development:

Engineers' Council for Professional Development, Chicago, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada.

BRITISH ENGINEERING SOCIETIES.

L. St.L. Pendred. Toronto, Longmans, Green, for the British Council, 1947. 38 p., illus., 8¾ x 6¼in., paper 1/6–.

This essay describes the three major engineering institutions of Great Britain—the Institution of Civil Engineers, the Institution of Mechanical Engineers, and the Institution of Electrical Engineers. Their history, their influence on the profession, and their important activities are outlined. An introduction gives a brief survey of the other engineering associations in Great Britain.

BRITISH STANDARDS INSTITUTION. STANDARDS.

London, the Institution, 1948.

BS 138:1948—Portable Fire Extinguishers of the Water Type (Soda Acid) *2/6–.*

Applies to the class of extinguisher in which the pressure required to expel the liquid contents is generated by the chemical action of an acid, in conjunction with a carbonate or bicarbonate solution.

BS 740, Pt. 1:1948—Portable Fire Extinguishers of the Foam Type. *2/6–.*

Applies to the class of extinguisher in which the pressure to expel the contents is generated by the chemical action of an acid salt solution stored in an inner container of an extinguisher, in conjunction with a carbonate or bicarbonate solution in combination with a stabilizer, stored in an outer container of the extinguisher, which when combined with the acid salt will produce foam.

BS 1382:1948—Portable Chemical Fire Extinguishers of the Water Type (Gas Pressure). *2/6–.*

Applies to the class of extinguisher in which the pressure required to expel the extinguishing medium (water) is produced by the compressed gas from a pressure container attached to or fitted into the extinguisher.

BOILER HOUSE AND POWER STATION CHEMISTRY, 2nd ed.

Wilfrid Francis. Toronto, Longmans Green, 1947. 274 p., illus., 8¾ x 5½ in., cloth, 21/–.

This book is intended to provide chemists, students of fuel technology and operators of boiler plant and power stations, with an introduction to the chemical considerations involved in the combustion of coal and in the generation of steam and electricity. The second edition has been written with a view to anticipating some of the changes in boiler house and power station practice that may be expected to materialize, so that the chemist, combustion engineer or fuel technologist associated with the generation of steam and electricity will be ready for developments of this character.

DOMINION OF CANADA INCOME TAX ACT, effective January 1, 1949, and EXCISE TAX ACT, 14th ed.

CCH Canadian Ltd., Toronto, 1948. 256 p., 9 x 6 in., paper, $2.00.

This edition contains the full text of the new Income Tax Act which is effective January 1, 1949. Each subsection of the Act is supplemented with a note giving the text of the analogous section or part of the Income War Tax Act as last amended. Also included are the Canada-United States Tax Convention Articles, the Canada-United Kingdom Tax Agreement and the Canada-New Zealand Income Tax Agreement.

HANDBOOK OF SCIENTIFIC AND TECHNICAL SOCIETIES AND INSTITUTIONS OF CANADA.

S. J. Cook and J. R. Kohr. Ottawa, National Research Council, 1948. 62 p., 9¾ x 6¾ in., paper, 25c.

This is a directory of 166 Canadian associations which contribute to the advancement of scientific and technical knowledge. It contains such data as address, officers, purpose, funds, publications, and changes of name of the organizations listed.

POLARIZED HEADLIGHT SYSTEM.

U.S. Highway Research Board, Washington, 1948. 36 p., illus., 9¾ x 7 in., paper. (U.S. Highway Research Board, Bulletin No. 11).

The chief objective of the polarized headlight system is to provide ample visibility for driving and to eliminate the glare from this light intensity. The principle is based on the optical law that if a beam of light is passed through certain crystals it will come out with waves in only one plane instead of vibrating in every direction. There are still some practical problems to be solved in connection with the optical system and installations.

RULES FOR WELDING PIPING IN MARINE CONSTRUCTION; CARBON STEEL ONLY.

American Welding Society, N.Y., 1948. 5 p., illus., 9 x 6 in., paper, 25c.

The purpose of this publication is to effect a uniformity in the classification and basic welding requirements for piping of the governing agencies in the shipbuilding industry. In this new edition materials and classification of piping have been revised and thereby clarified. Requirements have been made to conform more closely to requirements for stationary piping and have also been broken down into more specific groupings.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

ATOMIC ENERGY.

Karl K. Darrow. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London, 1948. 80 pp., illus., diagrs., tables, 8½ x 5½ in., cloth, $2.00.

This small book contains four lectures given in the Norman Wait Harris lecture series at Northwestern University in 1947. The lectures include as much of the science of atomic energy as possible to give in four hours to an audience consisting largely of people whose special fields of interest were other than physics.

GUIDE TO TECHNICAL WRITING.

W. G. Crouch and R. L. Zetler. Ronald Press Company, New York, 1948. 401 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $4.00.

This book covers both the techniques of various kinds of communications and the principles of writing. The business letter, technical article, report, abstract, and types of oral communication are considered in the first section. The chapter, "Language Essentials", reviews the fundamental principles. The "Index to English Usage" which follows has been arranged alphabetically and has been limited to essentials of English and grammar which technical men must employ. Throughout the style has been kept informal, even conversational.

PRINCIPLES AND METHODS OF TELEMETERING.

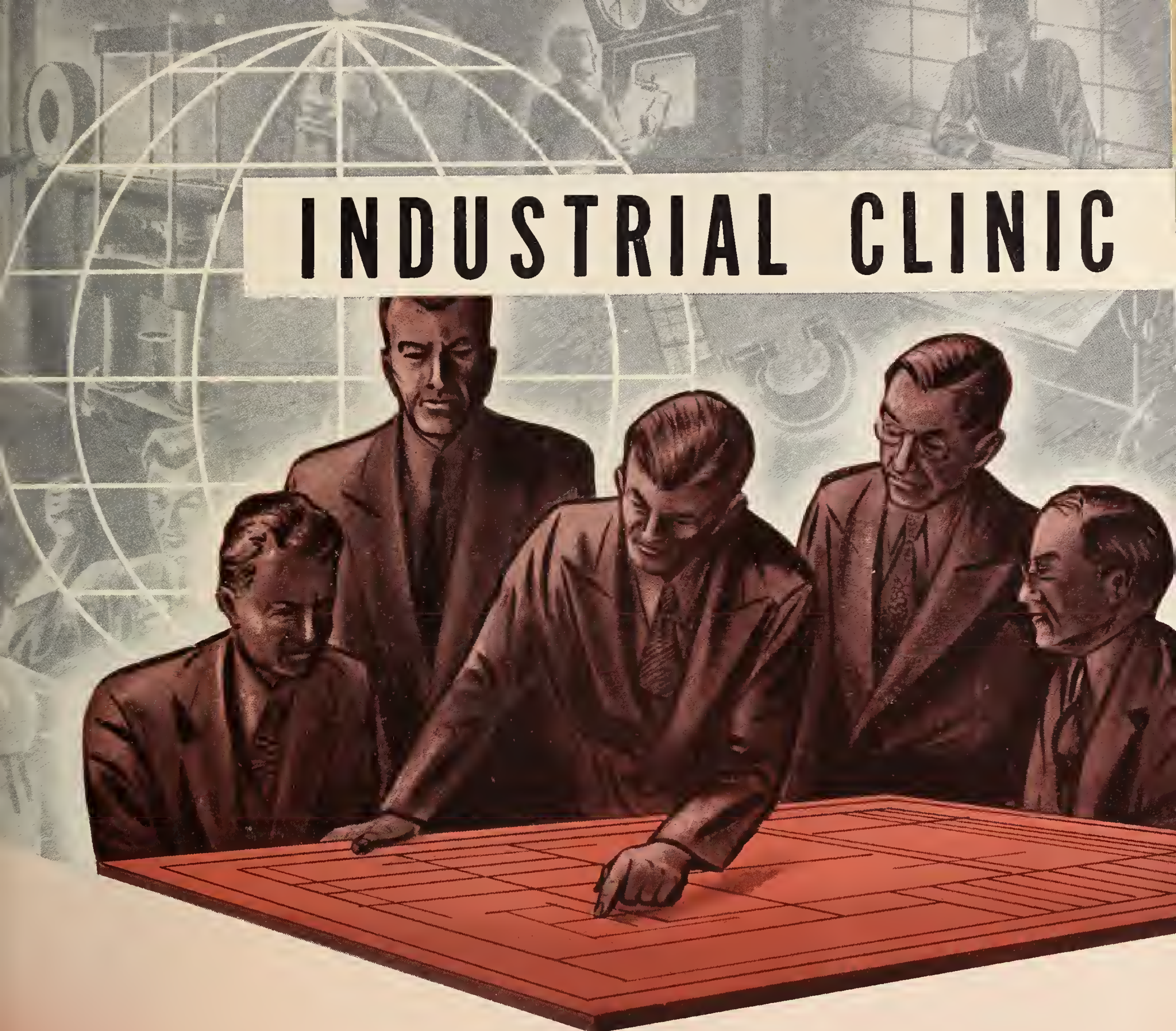
P. A. Borden and G. M. Thynell. Reinhold Publishing Corp., New York, 1948. 230 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.50.

Discussing the various types of telemetering systems, this book also considers the instruments used in America today. In addition to the principles and applications, it gives an analytical and descriptive treatment of the large variety of telemetering devices produced by seventeen companies. Installation methods, adjustments, and operating procedures are not included. Neither is there a repetition of detailed description of long known and well publicized systems, but rather abbreviated remarks. The bibliography covers both papers and patents.

ROTARY DRILLING HANDBOOK.

J. E. Brantly. 4th ed. rev. Palmer Publications, Los Angeles, New York, London, 1948. 568 pp., illus., diagrs., charts, tables, 7½ x 5 in., fabrikoid, $7.50. (U.S. funds)

This handbook was written for the use of floormen, drillers, toolpushers, superintendents, engineers and students of petroleum and drilling engineering. It contains all of the material and tables needed by the field engineer and practical rig operator. In this revised edition, several chapters have been rewritten and sections on newly developed practices have been added. The latest important advances affecting the mechanical operations of the rotary drilling industry have been included.



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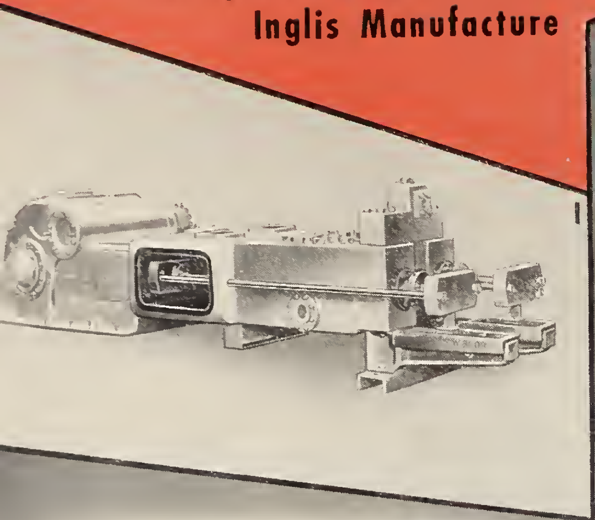

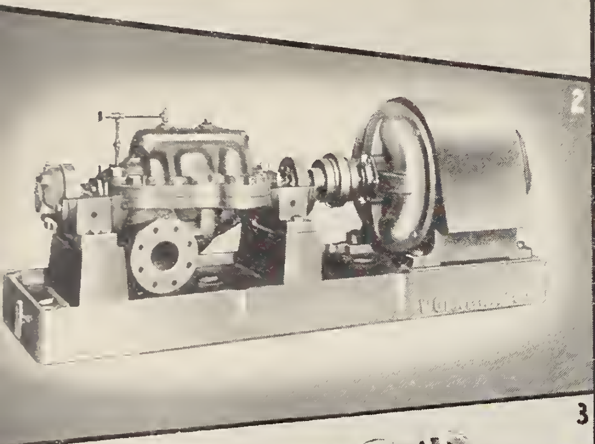

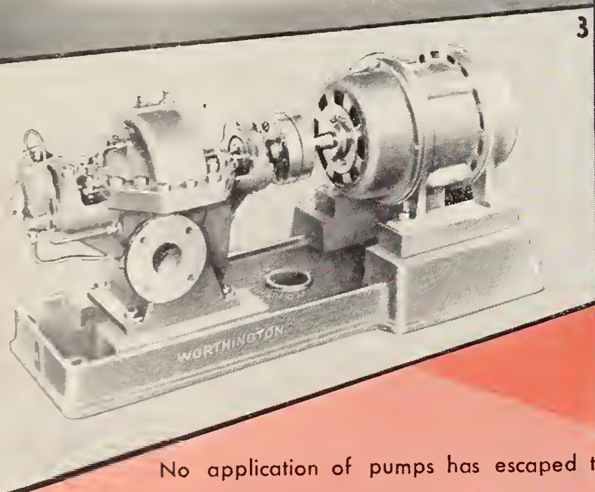

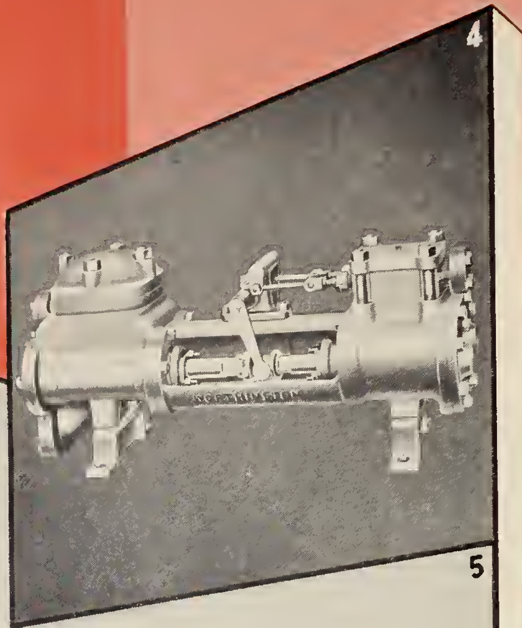

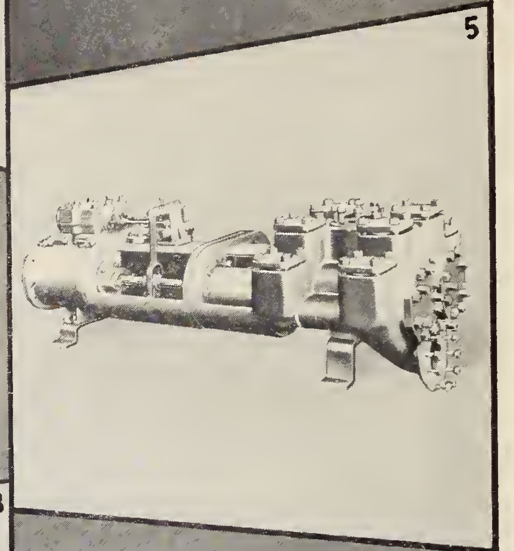

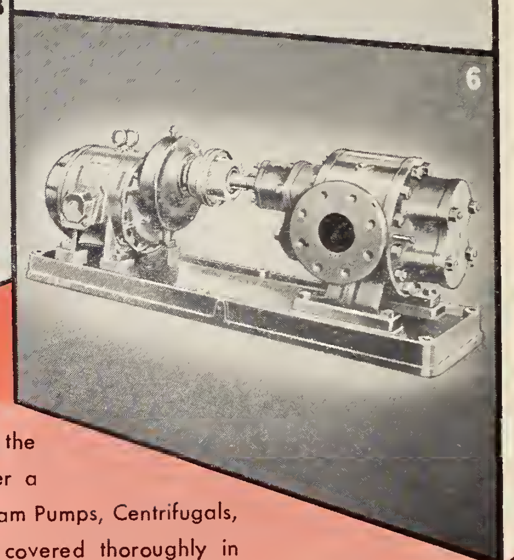

No application of pumps has escaped the study of Worthington designers in over a hundred years of producing pumps. Steam Pumps, Centrifugals, Power or Rotary Gear Pumps, all are covered thoroughly in the Worthington line. In Canada, Inglis applies the precision methods required for ordnance production to the manufacture of Worthington Pumps. Descriptive literature on pumps for any purpose is available at your request.

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6. Rotary pump - Type GR.
7. Power pump - Type VTE.

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SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS, Proceedings, Volume V, No. 2.

Edited by C. Lipson and W. M. Murray, published and distributed by Addison-Wesley Press, Inc., Kendall Square, Cambridge 42, Mass., 1948. 153 pp., illus., diagrs., charts, tables, 11 x 8¼ in., cloth, $6.00.

The sixteen papers presented in this volume cover various aspects of stress and strain analysis chiefly by strain-gage and photoelastic methods. Special topics dealt with are: a pendulum analyzer for mechanical transients; photo-grid process for measuring strain in underwater explosions; the selection of allowable stresses for steel members; investigation of buckling shock mount.

SURVEYING.

W. Norman Thomas. 4th ed. Longmans, Green and Co., Toronto, New York; Edward Arnold & Co., London, 1948. 564 pp., illus., diagrs., charts, maps, tables, 8¾ x 5½ in., cloth, 30s., $9.00 (in Canada).

This standard British text describes in detail the instruments and procedures used for all kinds of surveying work: levelling, plane table surveying, curve ranging, earthwork calculations, triangulations, hydrographic, photographic and aerial surveying. Particular attention is paid to the adjustment of instruments, and a new chapter on the adjustment of errors has been added in this edition.

YEAR BOOK OF THE HEATING AND VENTILATING INDUSTRY, 1948.

Technitrade Journals, Ltd., 8 Southhampton Row, London, W.C.1, England. 206 pp., illus., diagrs., 8¾ x 5½ in., cloth, 5s.

Of interest to architects, consulting engineers, and those who deal with heating and ventilating contractors, this compact volume contains technical, contractual and trade information. In addition to articles on various phases of the field, there are a buyer's guide, a list of technical and trade associations, and a list of trade names. The officers and members of the Association of Heating, Ventilating and Domestic Engineering Employers are also included.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

CHEMICAL AND ELECTROPLATED FINISHES.

H. Silman, foreword by H. Moore. Chapman & Hall, Ltd., London, 1948. 414 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 30s.

This book presents a reasonably comprehensive account of modern industrial metal-finishing processes, together with the chemical and physical principles involved. It is of interest to engineers and designers and those concerned more directly with the scientific and technical aspects of metal finishing, both from the process and plant angles. All finishes which are applied to metals for both protective and decorative purposes from aqueous solutions with or without use the of electric current are included.

CURRENT-COLLECTING BRUSHES IN ELECTRICAL MACHINES.

By M· E. Hayes. Sir Isaac Pitman & Sons, Ltd., London, 1947. 191 pp., illus. diagrs., charts, tables, 8¾ x 5½ in., cloth, 21s.

Beginning with introductory chapters on carbon as a material and on the various types of carbon brushes, this comprehensive work proceeds with a detailed treatment of the design and use of such brushes. The principles and effective operation of current collecting devices are discussed with attention to wear and maintenance problems. A detailed table is given for the selection of brush quality.

ELEMENTARY MECHANICAL VIBRATIONS.

By A. H. Church. Pitman Publishing Corporation, New York and London, 1948. 200 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.25.

Based upon courses given at New York University, this book covers the elementary principles and serves as an introduction to more extensive study of vibration problems. The author stresses the physical rather than the mathematical explanations of the phenomena. One chapter is devoted to balancing. A knowledge of mechanics and calculus is assumed· Extensive use of examples clarifies the text, and problems, with answers, are given at the end of each chapter.

ELEMENTS OF PHOTO-GRAMMETRY.

E. Church and A. O. Quinn. Syracuse University Press, Syracuse, New York, 1948. 120 pp., illus., diagrs., tables, 9¼ x 6 in., cloth, $3.00.

Prepared as a textbook for an introductory course in elementary photogrammetry, this edition presents the history and background together with basic principles and applications. Part I is devoted to fundamentals and includes chapters on field control and photographic interpretation. Part II consists of practical laboratory problems and contains sections on mapping methods.

EQUIPEMENT THERMIQUE DES USINES GENERATRICES D'ENERGIE ELECTRIQUE, 2d ed.

J. Ricard, preface by E. Mercier. Dunod, Paris, 1948. 659 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., paper, 2900 frs.

This comprehensive text on the thermal equipment of electric generation plants covers in detailed form the following topics: steam cycles; heat transmission and heat exchangers; fuels and combustion; steam boilers and boiler furnaces; feedwater treatment; condensers and auxiliary equipment; steam turbines; plant construction, layout, and economics; selection of equipment and operative procedure; and the simultaneous production of steam and electrical energy.

FREE GOLD, the Story of Canadian Mining.

By A. Hoffman. Rinehart & Company, New York and Toronto, 1947. 420 pp., maps, woodcuts, tables, 8¾ x 5½ in., cloth, $5.00.

The development of the Canadian gold fields is told in narrative form by one of two brothers from Boston who struck out into the Canadian wilderness some twenty-five years ago. He describes the places and the men that were of importance in that development, the technical aspects of the mining industry, and the financial operations. The book is enlivened by anecdotes and first-hand accounts of the adventurous side of mining, but the emphasis throughout is on the tremendous account of toil and hardship behind what looks like an easy money proposition.

INDUSTRIAL ELECTRONICS REFERENCE BOOK.

Electronics Engineers of the Westinghouse Electric Corporation. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London, 1948. 680 pp., illus., diagrs., charts, tables, 12 x 8¾ in., cloth, $7.50.

The work of thirty-seven Westinghouse experts, this comprehensive book gives both the theoretical data and application information necessary to determine the possibilities and limitations of electronic devices. It covers fundamental theory; design, operation and construction of electronic tubes; electronic circuit components; circuits for different types of tubes; application to transmission lines and antennas; and many different types of industrial equipment. Care and maintenance of electronic tubes and apparatus are also considered.

INTRODUCTION A L'ETUDE DES RESEAUX ELECTRIQUES.

M. Parodi, preface by L. de Broglie, Société d'Edition d'Enseignement Supérieur, 99 Boulevard Saint-Michel, Paris 5e, 1948. 54 pp., diagrs., tables, 10 x 6½ in., paper, 200 frs.

The three chapters of this mathematical study of electrical networks cover respectively the characteristic matrices of connected networks, applications of the transformation theory to such networks, and an analysis of the energy-producing properties of passive networks.

METALLURGICAL MATERIALS AND PROCESSES.

By J. Elberfeld. Prentice-Hall, Inc., New York, 1948. 188 pp., illus., diagrs., charts, tables, 9¼ x 6 in., linen, $5.00; text ed., $3.75.

Intended as a text for students specializing in fields other than metallurgy, this book provides a general background in the science of metals. Emphasis is given to grain structure and constitution diagrams. Among the topics included are heat-treating furnaces and their controls, the forming of metals, welding and powder metallurgy, and laboratory procedure. Questions and summaries accompany each chapter, and an outline of the chemistry necessary for understanding the text is presented.

PRODUCTION COST TRENDS IN SELECTED INDUSTRIAL AREAS.

P. Neff, L. C. Baum and G. E. Heilman. University of California Press, Berkeley and Los Angeles, 1948. 249 pp., charts, tables, 9½ x 6 in., cloth, $4.00.

This statistical study compares manufacturing cost trends in the industrial areas of Los Angeles, San Francisco, Detroit, Cleveland, Chicago and Pittsburgh for the period 1929-1939. The trends in general manufacturing are first considered; then durable goods, such as food, textiles, paper, rubber products, etc.; and finally a number of selected industries are dealt with. The data utilized are taken mainly from the U.S. Census of Manufactures.

QUALITY CONTROL IN INDUSTRY, METHODS AND SYSTEMS.

By J. G. Rutherford. Pitman Publishing Corporation, New York and London, 1948. 201 pp diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50.

Rec mmended as a text in industrial engineering courses, this book is also a reference manual for industrial engineers, executives and supervisors. It covers the organization, administration and functions of a department. Explaining and illustrating the actual methods of installation, it also gives complete data for the introduction, design and use of statistical sampling techniques. Part I contains generalized information outlining organizational practices and methods. Part II discusses statistical procedures.

RADAR, WHAT RADAR IS AND HOW IT WORKS, rev. ed.

O. E. Dunlap, Jr. Harper & Brothers, New York, 1948. 268 pp., illus., diagrs., 8¼ x 5¼ in., cloth, $3.00.

This popularly written book tells the story of radar without equations or technical language, so that the layman may appreciate the significance of radar. This new edition explores the postwar advances and provides information on how radar is being adapted to scores of peacetime uses.

RESIDENTIAL LIGHTING.

M. Fahsbender, D. Van Nostrand Company, New York, Toronto, London, 1947. 269 pp., illus., diagrs., charts, tables, 11¼ x 8½ in., cloth, $10.00.

This volume furnishes the facts, figures, and practical details of arrangement and design of home lighting. The various types of lighting equipment are described, the influence of period styling on lighting fixture design is explained, and portable lamps and lamp shades are treated in detail. Illumination requirements in various rooms, home wiring, light and vision, and light and color are treated. Emphasis is placed upon newly developed light sources such as fluorescent lighting, and special topics such as garden lighting and Christmas lighting are included. Five hundred and sixty-nine photographs and drawings illustrate the text.

SOME ASPECTS OF THE LUMINESCENCE OF SOLIDS.

F. A. Kröger. Elsevier Publishing Co., New York, Amsterdam, London, Brussels, 1948. 310 pp., diagrs., charts, tables, 8¼ x 6 in., cloth, $5.50.

Based on recent experimental work, this book contains some hitherto unpublished results together with theoretical considerations of certain aspects of this field. In the first chapter brief consideration is given to the energy levels in pure and disturbed crystals. A general picture is developed covering all possible luminescent effects, new experimental results are reported concerning some particular luminescent systems, and the final chapter is devoted to the influence of temperature on the efficiency of luminescence.

SURFACE CHEMISTRY FOR INDUSTRIAL RESEARCH.

J. J. Bikerman. Academic Press, Inc., New York, 1948. 464 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.00

This book presents the fundamental knowledge necessary for solving problems of physics and chemistry of surfaces and interfaces. The action of adhesives, friction and lubrication, ore dressing, emulsion stability and detergency are considered together with a variety of other phenomena. The book emphasizes such factors as the roughness of solid surfaces, the miscibility of "immiscible" liquids, and the sensitivity of physical quantities to common impurities.

SYNTHETIC PETROLEUM FROM THE SYNTHINE PROCESS.

B. H. Weil and J. C. Lane. Chemical Publishing Co., Inc., Remsen Press Division, Brooklyn, New York, 1948. 303 pp., illus., diagrs., maps, tables, 8¼ x 5¼ in., cloth, $6.75.

This survey of the current knowledge of the Fischer-Tropsch Process covers methods of production, the theoretical and engineering phases, purification of the synthesis gas, catalytic synthesis reactions, the products, by-products and derivatives. The basic economics is covered, and advances in German technology are discussed. There is an indexed list of government reports and systematic reference is made to over 2,000 articles and patents.

SYSTEMATIC MOTION AND TIME STUDY.

By M. E. Mundel. Prentice-Hall, New York, 1947. 232 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00; text ed., $3.00.

This new book presents the basic elements of time and motion study, demonstrates actual jobs and cases with resultant benefits, and discusses what results may be expected from effective application of the advocated principles. The necessary charts graphs and records are described and illustrated, and considerable space is devoted to the separate steps in the taking of a stop-watch time study. Ratings, allowances and standards are covered, as are process analysis and layout.

(THE) CHEMISTRY AND TECHNOLOGY OF WAXES.

By A. H. Warth. Reinhold Publishing Corporation, New York, 1947. 519 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $10.00.

Of use to those engaged in a variety of industries, this volume covers the classification, description, origins, preparation and refining of more than 200 individual waxes, including significant facts on the chemistry of high-carbon constituents of waxes. The physical and chemical constants of waxes are presented in tabular form. Detailed procedures for their determination are given. A review of available patent material and a wealth of references are included, as well as a section on the application of waxes.

THEORETICAL AERODYNAMICS.

L. M. Milne-Thomson. D. Van Nostrand Co., Toronto, New York, and London, 1947. 363 pp., diagrs., charts, tables, 10 x 6½ in., cloth, 40s.

Based on lectures given at the Royal Naval College, this book discusses the assumptions used in studying the airflow around aircraft. It brings these assumptions to explicit statements and then examines what can be deduced from them. After preliminary discussion, the theory of two-dimensional airfoils is considered. Three-dimensional airfoils, the effect of compressibility of air in subsonic and supersonic flow, and the aircraft as a whole are subsequently considered. About 300 exercises, 260 diagrams, and appropriate references to the literature are also included.

WATER PURIFICATION CONTROL, 3d ed.

E. S. Hopkins. Williams & Wilkins Company, Baltimore, Md., 1948. 289 pp., illus., diagrs., charts, tables, 7¾ x 5½ in., cloth, $4.00.

This is a practical guide for operators of water purification plants. Revised to conform with modern practice, it is based on the author's own experiences at the Montebello Filters in Baltimore and elsewhere. A new section on the removal of iron and manganese has been added.

Business & Industrial Briefs

A Digest of Information received by The Editor

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Link-Belt Ltd., Eastern Avenue at Leslie and Keating Sts., Toronto, 8, announces Book No. 2330 in which is described the Company's overhead trolly conveyors. It contains eighty illustrations which show the flexibility and adaptability of this type of conveyor.

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Canadian General Electric Co. Ltd., 212 King St. W., Toronto, 1, has recently published an illustrated ten-page bulletin on its Pyranol distribution capacitors. The bulletin should be most useful to utility engineers. It shows in detail the construction of the individual pole-type units and their installation in a variety of applications. Apply to any CGE office and ask for bulletin CGEA-2561F.

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C. O. Monat & Company, Limited, 6520 Park Ave., Montreal, offers No. 3 of the Sulzer Technical Review. This publication contains an article on Diesel-electrical emergency generating sets in which the main applications and the operation of this automatically controlled equipment is described. A second article covers some of the problems arising in the choice and installation of centrifugal pumps for steam power stations. Another feature of the publication is a contribution in which is described model equipment developed in the Sulzer thermal laboratory for research into regulating processes. Copies of the publication are available on request.

•

Ilg Electric Ventilating Co., Chicago, announces the release of a new Unit Heater Catalogue No. 348. The new catalogue pictures and describes the advantages of using unit heaters to heat the area from the floor line up to about six feet above that level. A complete description is given of the BTU method of estimating heat requirements with examples and necessary tables. Much other informative data is included.

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Wright & Weaire Ltd., of 138 Sloane Street, London, S.W.1, England, offers a small two-colour brochure on the Wearite vice which is described by manufacturer as "The Vice with a thousand virtues". Some of the advantages of this equipment are that the jaws are automatically self-adjusted so that they can hold non-parallel surfaces such as wedges and mandrels. The normal gripping strength of the vice is 186 lbs., as this can be increased to 440 lbs. Copies of the brochure are available.

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Garlock Packing Company of Canada Limited, 620 Cathcart St., Montreal, has available a supply of an excellent two-colour brochure on the Company's rubber expansion joints for pressure, vacuum, or pressure and vacuum. The publication is well illustrated and highly informative.

•

Readers of the Journal who wish to be placed on the mailing list for "Aluminium News" or the Alcan "Ingot" are invited to apply to the director of public relations, the Aluminum Co. of Canada, Ltd., 1700 Sun Life Bldg., Montreal. These publications are well edited and contain much interesting information.

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Canadian General Electric Co., Bulletin CGEA-1265D, in which is described the company's thermostat for use with small heating units, is recommended. Copies may be obtained from any CGE office.

•

Readers who are interested in obtaining a list of the publications produced by the International Nickel Company of Canada, Ltd., 25 King St. West, Toronto, are invited to communicate with the Company asking for "List 'A'—Helpful Publications on Nickel Alloys." This guide to the Company's list of technical publications has been prepared in the form of a digest of contents and a check list. By means of this list it should be possible to complete in a very few minutes a request for the publication desired.

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Copies of the December issue of the BEPCO Journal published by Bepco Canada Limited, 4018 St. Catherine St W., Montreal, 6, may be obtained on request. This issue contains a tribute to the inventive genius of A. F. Berry and an account of fifty years of transformer engineering.

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Landis Thread Tips—produced by the Landis Machine Co., Waynesboro, Penn., is one of the publications which is published periodically by this well-known firm of machine tool manufacturers. It contains descriptions and specifications of the Company's products. Write to the Company if you wish to have your name placed on the mailing list.

•

Chain Belt Company, 1600 W. Bruce St., Milwaukee, 4, Wis., has published in full colour a 1949 calendar illustrating the Company's equipment on the job. Copies will be forwarded to readers of the Journal on request.

•

A complete presentation of the Rapistan line of floor trucks is contained in a new four-page bulletin issued by the Rapids-Standard Company, Inc., of Grand Rapids, Michigan. The two-colour bulletin includes photographs, descriptions and specifications of the various models of floor trucks manufactured by the company. Ask for bulletin TR-848.

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An attractive two-colour eight-page brochure in which is described the operations and features of the new Barbar-Greene Model 522 Snow Loader is now available from the Company. Write to Barber-Greene Co., Aurora, Ill.

•

Convair Corporation, Pittsburgh, Pa., specialist in pneumatic conveying systems, has informed the editor that it will send readers of the Journal copies of its bulletin No. 102. Write to the Company for your copy.

•

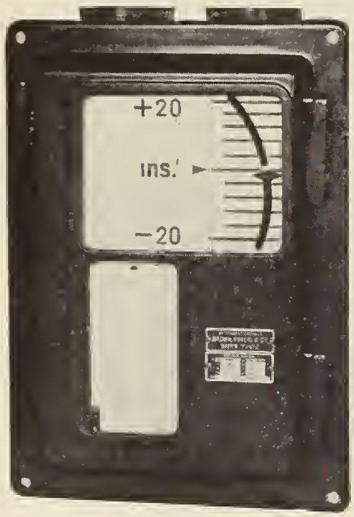
Tweco Products Company, P.O. Box 666, Wichita, 1, Kansas, will forward on request a new twelve page catalogue, No. 7, which illustrates the complete line of electrode holders, ground clamps, cable connectors, cable splicers, terminal connectors, cable lugs and carbon electrode holders manufactured by the Company. In the release which accompanied the catalogue sent to the editor it was stated "All requests from your readers will be promptly handled."

New Equipment and Developments

Canadian Vickers Limited and the Sandy Hill Iron and Brass Works of Hudson Falls, N.Y., announce that arrangements have been concluded between the two companies whereby Sandy Hill products will be made in Canada by Canadian Vickers Limited. The Sandy Hill Company specializes in the manufacture of pulp and paper machinery.

•

The Tremco Mfg. Co. (Canada) Ltd., 57 Bloor St. W., Toronto, Ontario, announces that it now has available a new alkali resistant floor enamel—Color-floor XX, for painting concrete floors. It is stated that this rubber base interior enamel may be used safely for painting basement floors and other concrete floors on or below grade, so long as no hydrostatic pressure exists. It is especially recommended for recreation rooms in basements and concrete floors built on the ground. It is claimed that it resists acids, alkalis, soaps, oil, grease, alcohol and offers good abrasion resistance. It is furnished in red, medium grey and dark green.



The "Nivometer"

Brown-Boveri (Canada) Limited, 1111 Beaver Hall Hill, Montreal, has announced a new type of liquid level indicator for boilers or any vessels containing liquid. Built without glass in the pressure space, it is available for pressures up to 1500 lbs./sq. inch, and special models are available for pressures up to 5000 lbs./sq. inch. Measuring ranges are from 12 inches up to 13 feet as required. The instrument is known as the "Nivometer". Full information and descriptive pamphlet are available from the Company.

•

The Muller Machinery Company, Metuchen, New Jersey, are manufacturing and marketing a new plaster mixer. The machine is of six cu. ft. capacity and has been designed to meet the rough working conditions so often found on plastering jobs. It is driven by a Briggs & Stratton engine through a heavy roller chain drive and is equipped with a bag shelf and bag splitter. It is fabricated of steel throughout and runs on disc type wheels fitted with roller bearings and pneumatic tires. Literature and full information are available from the manufacturer.

•

A variable pitch diameter clutch is now being manufactured by W.S.K. Inc. of Detroit. It is recommended for use with gasoline or electric power sources and it is claimed that it eliminates the need for expensive clutch assemblies. For complete details write to W.S.K. Inc., 405 Donovan Bldg., Detroit 1, Michigan.

•

A new cutting blowpipe, known as the Oxweld C-60 Machine Cutting Blowpipe—believed to be the world's largest—has been announced by Dominion Oxygen Co. Ltd. It has been designed for extra-heavy cutting operations, such as the scrap-cutting of skulls and buttons. Cutting of steel over six feet thick has been reported.

•

Canadian General Electric Co. Ltd., states that its instantaneous electronic mercury vapour detector has been designed to measure concentrations of mercury vapour in the air which may be injurious to the health of workers. This detector operates on the principle that ultra-violet light is scattered when it passes through atmosphere containing mercury vapour. A small blower draws air from the atmosphere into the instrument at a rate of ¼ cubic ft. per minute, and passes it between an ultra-violet light and a phototube. Variations in the output of the phototube cause the electronic circuit to indicate the concentration of mercury vapour in the air. The detector will measure mercury-vapour concentrations ranging from 0.03 to 3.0 milligrams per cubic meter, or from 0.004 to 0.37 parts per million by volume with an accuracy of approximately five per cent. It weighs only 29 lbs., and can be carried on an adjustable shoulder strap. Complete information may be obtained from this manufacturer.

•

Gutta Percha & Rubber, Limited paid tribute to the 391 members of its 25-year Club at a recent dinner held at the Royal York Hotel. At the dinner 30 new members were inducted into the club and each was presented with an engraved gold watch in recognition of long and valuable service to the Company.

•

A relatively small light weight, electric power industrial truck for fast manoeuvering and tiering loads has been developed by Elwell-Parker Elec. Co. of Cleveland, O. It has been designed for requirements in large merchandise warehouses and it is also suitable for use in manufacturing and shipping departments. Complete details are available from the manufacturer.

•

A power actuated tool for installing dropped ceilings has been developed by Mine Safety Appliances Co. of Pittsburgh, Pa. The operation can be accomplished in five seconds. This new tool may be used for a variety of purposes and the manufacturer will be pleased to supply specifications and details and make recommendations as to the correct use.

•

Sid Bersudsky and Associates, industrial designers have opened offices at 539 King St. West, Toronto. The new Toronto offices will have complete facilities for model making and construction of prototypes required in industrial design projects.

•

New equipment for testing ball bearing grease under conditions similar to those of field use is available from Canadian General Electric special products section. The new ball-bearing-grease tester accelerates those conditions which contribute to the destruction of a grease, thereby enabling motor users and grease manufacturers to compare the performance of one grease to another. Complete information about this new equipment may be obtained from the Canadian General Electric Company, 212 King St. W., Toronto.

•

According to information received from the Canadian Ingersoll-Rand Co., many heavy machine maintenance jobs in the industrial, electrical and construction fields can now easily be handled with a new model of the Company's electric rotary impact tool. With standard accessories, the new model is conservatively rated to run and remove nuts up to ⅝" thread size; drive and remove studs; extract broken cap screws and studs; apply and remove machine screws of all kinds; run wire brushes; drill brick, metal and masonry; tap; and ream. It may also be used for wood-boring. For further information write to the company at 800 New Birks Bldg., Montreal.

•

Work under the direction of The Consolidated Mining and Smelting Co. of Canada, Ltd., on the 500 square mile Pine Point Concession on the South shore of the Great Slave Lake, which was started early in July, is continuing under a proposed 3-year programme.

Appointments and Transfers

Herbert M. Treleaven has been appointed sales manager of the Trane Co. of Canada, Ltd.

•

J. H. Smith has been named manager of the CGE Toronto district office-apparatus division. F. A. Sutton has been appointed manager of the supply division in the same district.

•

E. M. M. Partridge has been appointed to the staff of the United Kingdom trade commissioner in Montreal. Mr. Partridge has had a number of years of

banking experience. He joined the armed forces in September, 1939, and rose to the rank of Lt. Colonel. He saw service in France before Dunkirk and later in New Guinea where he was attached to the Australian Army. He also served in India. On demobilization he entered the British Civil Service.

F. M. Williams

F. M. Williams has been appointed a service engineer by the English Electric Co. of Canada Limited. Mr. Williams' duties will include the investigation of all major complaints originating in the field. In addition he will be responsible for all field installation work. He has been in the employ of English Electric Co. in Great Britain and Canada for a number of years.

•

Steve A. Batorson has been named District Sales Representative for the northeastern United States and eastern Canada for the LeTourneau Company. His territory in Canada will include New Brunswick, Nova Scotia, Newfoundland, Labrador and Prince Edward Island. Mr. Batorson's Headquarters will be in Syracuse, N.Y.

•

R. P. Hiseler has been appointed manager of the a-c/d-c section of the Canadian General Electric Company's Apparatus Department.

•

Canadian Ingersoll-Rand Co. Ltd. announces the appointment of Donald MacLennan as assistant manager of purchasing. He will be located at the Company's plant in Sherbrooke, Que.

•

Gordon Francis McClay, formerly assistant to the manager of engineering has been appointed assistant manager of engineering by the Canadian Ingersoll-Rand Co. Ltd. He will be located at Sherbrooke, Que. His duties will include the supervision of the Company's engineering staff together with product development research. He is a native of Foster, Que., and has been with the Company since 1913.

NEWS of the BRANCHES

(Continued from page 45)

Vancouver

A. G. Fletcher, s.e.i.c.
Secretary-Treasurer

Stuart Lefeaux, jr.e.i.c.
Branch News Editor

The annual dinner meeting of the branch was held in the York Room of the Hotel Georgia on Saturday, November 20th. The minutes of the last annual meeting were read and adopted and the secretary-treasurer presented the financial statement for the year. John Buchan was again appointed auditor for the branch.

P. B. Stroyan, chairman, gave a brief report of the branch activities during the year. The total membership of the branch is now 786, the student membership being 402. Eight evening meetings and three plant visits were held during the year. The branch was honoured by the election of President J. N. Finlayson at the Banff convention. Mr. Stroyan thanked the members and officers for their co-operation and support during the year.

J. P. Fraser reported for the nominating committee and George Allan, chairman-elect, took over his new duties. R. E. Potter was elected vice-chairman and A. G. Fletcher, secretary-treasurer. J. E. Macdonald, G. H. Bancroft and A. M. Eyre, were elected to the executive committee for two year terms.

George Allan thanked the members for his election to the chair and asked Jack Macdonald to introduce Walter Owen, K.C., the guest speaker for the evening. Mr. Owen, a U.B.C. graduate, was appointed K.C. in 1944 and has had extensive experience in labour relations. The title of his address was **The Growth of the Labour Union.**

The basic rights of the individual have been assumed by the unions as union members are told where and for whom they may work. The unions have accomplished much for the working man but are now becoming too powerful and autocratic. Mr. Owen explained the phenomenal growth of the labour unions in Canada as brought about by the war, government legislation and communist activities. He deplored the facts that Canadian industrial unions pay funds to United States head offices and that autonomy is given up to the union's International policy. The difference between "closed shop" and "union shop" was outlined; the closed shop is not favoured by the union as it puts some responsibility on the union in the hiring of employees. The communist strength in unions was also deplored by Mr. Owen. He was most concerned about the tendency of unions to overlook the communist activities of their officers.

Dean J. N. Finlayson, Institute president thanked the speaker for his address and praised his work on industrial conciliation boards.

There being no further business, the meeting then adjourned.

Winnipeg

G. W. Moule, m.e.i.c.
Branch Secretary

R. H. Tivy, jr.e.i.c.
Branch News Editor

Electrical Section

J. C. Pratt, m.e.i.c.
News Editor

R. H. Andrews, high tension cable engineer of the Canada Wire and Cable Company, Toronto, addressed Electrical Section in Winnipeg, on the subject of **High Voltage Oil Filled Cable.**

R. H. Andrews, M.E.I.C.

The address was well illustrated throughout with lantern slides. The history, fundamentals of design and construction, and installation of high voltage oil filled cable were covered. A series of colour slides depicting the new sixty-nine-thousand-volt underground installation of the Winnipeg Hydro was of close interest to the audience.

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VOLUME 32 MONTREAL, FEBRUARY 1949 NUMBER 2

"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

★ ★ ★

CONTENTS

12,350 copies of this issue printed

COVER PICTURE

This month's cover was selected because it symbolizes the widespread industrial activity in Quebec which has resulted from the iron and titanium ore developments in the vast North-eastern areas of the Province.

The International TD-24 Diesel tractor equipped with Isaacson cable-operated Tracdozer is one of several units delivered to Fraser-Brace Engineering Co., Ltd., for use in construction of a 360-mile railroad between the Ungava iron ore area and Havre St. Pierre on the lower St. Lawrence.

Photo Courtesy Chas. Cusson Ltd.

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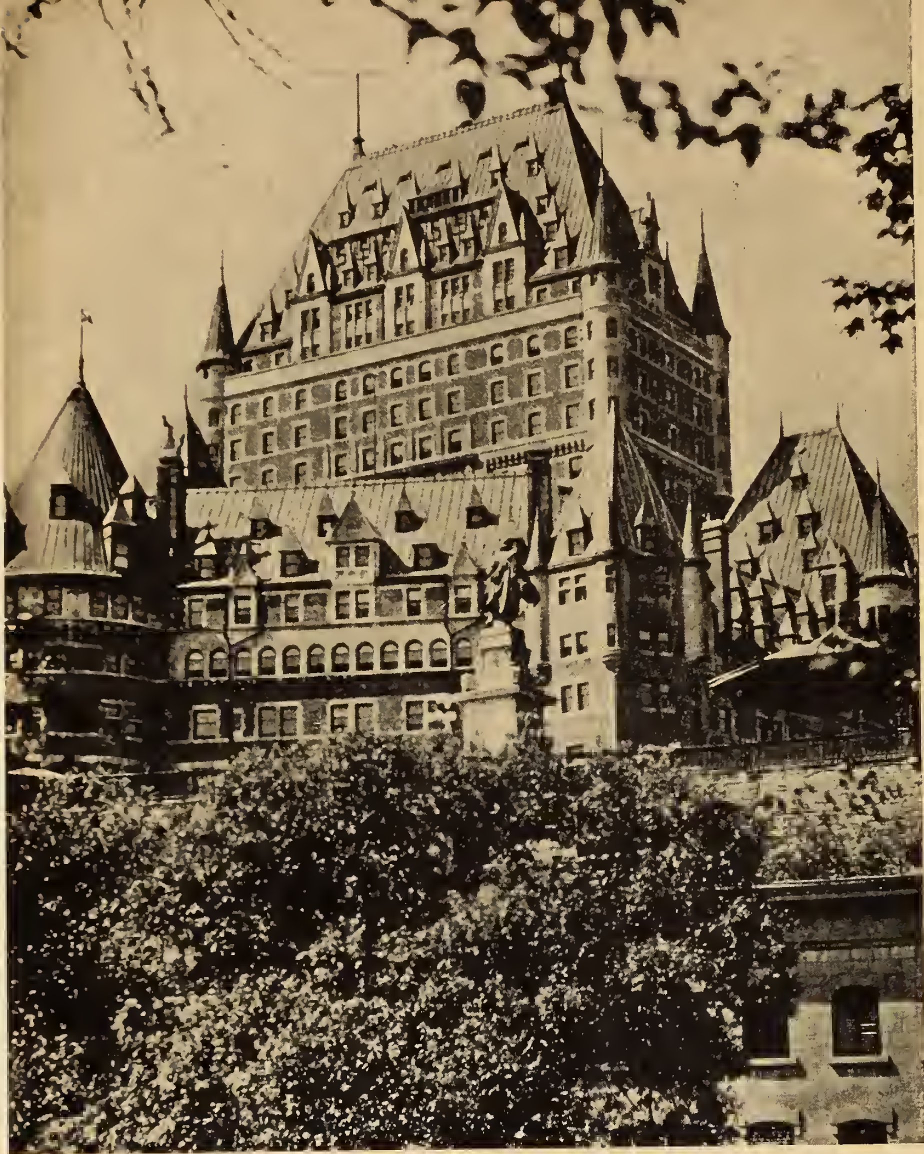

Chateau Frontenac, Quebec City

Historic Quebec City with its crooked, narrow streets, quaint and historic houses and churches is the "show-place" of North America.

Standing high above the City and overlooking the wide sweep of the St. Lawrence river is the Chateau Frontenac, one of the most famous hotels in the world. The Chateau will be the centre of all the activities of the Annual Meeting.

63rd ANNUAL GENERAL and PROFESSIONAL MEETING MAY 11th—13th 1949

- THE COMMITTEES have arranged an outstanding programme of professional and social events.
- The professional papers will cover many phases of engineering achievement and development and special emphasis will be placed on the "management" aspects of engineering.
- Tours of Quebec City and the surrounding district are being arranged and there will be many opportunities to enjoy with your friends the hospitality for which the Chateau Frontenac is renowned.
- Full details will be announced at an early date.

The Engineer's Part in Conserving Alberta's Resources

A paper presented at the Annual General and Professional Meeting of the Engineering Institute of Canada, at Banff, Alberta, June 2, 1948

by

John A. Allan, M.E.I.C.

Professor of Geology, University of Alberta

Calling attention to the fact that most of our resources are not inexhaustible, the author urges interest and cooperation in their development by engineers and scientists, as well as on the part of the Engineering Institute. Alberta's various resources of wild life, forest, soils, water, fuels and other minerals are discussed and the extent of utilization of each described.

Nature has endowed all parts of the surface of the earth with resources of some kind in varying degrees of abundance. Man is privileged to utilize those natural resources for his own, and for his neighbours' needs. But man is very irregularly distributed over the land surface, of which 40 per cent is desert or near desert and therefore unhabitable. According to a noted geographer (Prof. A. M. Carr Saunders, Geog. Jl., Dec., 1930), half the population of the world lives on 1/120th of the surface of the world. There is also a very uneven distribution of population in the habitable parts of the earth. Some areas are overpopulated, while other large areas are underpopulated. This uneven distribution applies to Canada, and even to Alberta, where population density is about four persons per square mile. The problem of overpopulation does not occur in Alberta.

It is suggested that the development and utilization of natural resources of any area depend only in part on the population. Local consumption and exportation to other near or far areas are factors of prime consideration in the marketing and utilization of resources. It would be national or provincial folly to develop, produce or manufacture raw materials if geography prevents the economic distribution of those products to areas where the population is less fortunate in respect to those natural products in the raw or manufactured form. The engineer can make a real contribution in the development and utilization of natural resources, by grasping the over-all picture in relation to production and conservation, not in respect to one resource only, but in the interrelation of all the natural resources of an area, which in this case is Alberta.

The pendulum of public opinion swings to and fro. In North America at least, we are entering upon an era of conservation. During a period of war, little thought is given to the future. Storehouses and stock piles of raw materials are drawn upon heavily through necessity. Following a war, stock taking of future reserves is given more serious thought. At no time in the history of civilization has the question of future requirements been thought about and studied more deeply and seriously by many. The engineer has an important part to play in this human drama of the future. He has not yet taken his rightful part in this all important problem of conservation.

It has been stated that conservation means "the greatest good to the greatest number — and that for the longest time". There is no cause for panic, but there are many good reasons why the engineer, in his orderly thinking and planning in projects under his supervision, should not remain in the vanguard. He should be out in front in his co-ordinated thinking, leading and directing conservation methods in all development undertaken in his field.

Resources Not Inexhaustible

Alberta is a young province including about 250,000 square miles. It is almost 200 years since the first white man saw Alberta, but it was not until some time after the Canadian Pacific Railway reached Medicine Hat in 1883, that any of the natural resources of Alberta were used, other than for meagre local domestic needs. Compared with some parts of Canada, the natural resources of Alberta are largely intact, since development is still in an early stage. Wastage in some resources has been serious but not too extensive, provided proper foresight is introduced into the necessary increased development.

Two of the most dangerous words used in referring to natural resources are *unlimited* and *inexhaustible*. The natural resources of the United States were considered by many to be inexhaustible. Some resources, like forests, were considered to be a detriment and even a menace to industrial development and must be burned or otherwise eradicated. In Canada, including Alberta, it was not until after the First World War that Canadians began to awake from a peaceful sleep of indifference. A few began then to think nationally, and to realize that natural resources were the most important asset to any country both today and tomorrow.

Even today too few in Canada fully appreciate the implication of development, utilization and conservation. It is hoped that the discussions taking place at this Convention will enable the engineer to see that to a greater extent than in the past, it is his duty to interest himself in, and implement in his actions, the same utilization and care of the resources for the benefit of individual and national income. The engineer can do much in striking a balance between the domestic and industrial needs of the people of today and those of the future.

There must be close co-operation between the engineer and the scientist in all problems related to the natural resources. General Dwight Eisenhower in an address in Ottawa, when he was honoured with the naming of a mountain west of Banff, emphasized that " the necessity for co-operation has not passed." Governments may and do regulate development and conservation of resources, but unless regulations are based on adequate scientific data, these protective measures are not effective. Here is where the engineer, the scientist and the technologist can obtain and analyse the scientific data, and pass on the results in order that governments can make more effective regulations. The engineer and the Engineering Institute should be in the best position to say what natural resources should or should not be developed within our National Parks.

Alberta's Resources

The natural resources of Alberta include fish, wild life, forest, soils, water and minerals. There are two groups of resources. The first three, namely, fish, wild life and forest, differ from the other three in that they are replaceable resources. By restocking the lakes and streams, the fish population can be maintained or increased. The wild life population is also replenishable and can be maintained by protective measures. But fish and wild life are increasingly important to Alberta. Both groups are protected fairly adequately by conservation regulations. The engineer can assist by his co-operation, chiefly by complying with regulations, and by realizing that these resources may be as vital to industrial development as the engineering project on hand.

The forest is one of the most vital factors in the long-range development of any part of the surface of the earth. The forest is a protective shield to all living matter, against the ravages of weather and climatic changes. The danger and devastation following the removal of forest mantle is only too well known. Proof of this change can be found in every continent. Large areas in India and China and in the Sahara desert, now waste lands, were well forested 2000 to 3000 years ago. The forest of today is a generation representing the development of only a few years. When a tree is removed, another tree may be planted to take its place, or nature may be allowed to regenerate a new forest. If this is not done the protective mantle has been removed from the soil and ground water, and dire results must be expected.

Alberta had a forest mantle estimated to cover 159,000 square miles, but fire and man have destroyed and therefore removed the protective mantle from many thousands of square miles. It is a fact that a part of this deforestation was justifiable in order to increase agricultural acreage. On the other hand, the removal of the forest has created a serious water supply problem, and in some parts, a soil erosion problem. Large areas on the plains are potential desert areas unless the forests are protected. The importance of forest protection in the watershed along the east slope of the Rocky Mountains has recently been realized. There has been set up the East Slope Conservation Board, a non-political body to undertake a reforestation programme. This important step in conservation requires the assistance and sympathetic support of all engineers. Since the underground water supply is dependent largely on the protective mantle, clearing and reforestation programmes should be based on scientific data.

Soils

All soils are young and are the product of the last few centuries. A new soil cannot be built up like a new tree, but the chemist and soil technologist can revive and build up an old soil. Since soil is related to and dependent upon other resources, the composition of the underlying rock, the forest, the rainfall, run-off, irrigation, etc., there must be full appreciation of cause and effect. Close co-operation of the geologist and other scientists, and the engineer are essential to the preservation of our soils.

Water

Water resources include the surface water in lakes and streams, and also the underground water derived only from the surface and therefore of meteoric origin. The deeper seated or juvenile waters are of minor consideration. Water resources are not inexhaustible as many seem to think, but are to a certain extent replaceable. Without rainfall water resources would become depleted and disappear. In developing water power and utilizing surface water, the engineer must fully realize the close, inseparable relationship between the forest, soil, and water resources. Without water there would be no soil, without water and soil there would be no vegetation, and without all three there would be no civilization. The surface of the earth would be like the surface of the moon. It has been pointed out that water and air are the only two essentials for the existence of life.

In the development of water resources, there are two different types of problems. Those associated with underground water supply are vastly different from those associated with surface water utilized for power and irrigation. Alberta abounds in surface water resources, with several major rivers that rise within the mountains in snowfields and icefields.

Power Development

To date power development by the Calgary Power Limited on the Bow River alone has an installed capacity of about 105,000 horse-power, and there are still several sites undeveloped on the Bow. There are also many undeveloped sites, both north and south from the Bow valley along or adjacent to the foothills belt. The suitability of a power site depends largely on the structure and composition of the underlying rock and on the character and thickness of the unconsolidated material. Geology is therefore a major factor in any power development within the mountains, foothills or on the plains, but the type of problem varies within these three different structural units.

Development of power to date within the foothills and mountains has been entirely along the Bow, not because the geological conditions are more favourable along this drainage, but because of several main factors. One of these is that more completely regulated flood control of the flow of a stream can be obtained from dams in tandem. A second factor is the stream load. The Bow is remarkably free from silt, partly because of the character of the terrain through which it flows, and partly because Bow Lake, Lake Minnewanka, and many other smaller settling basins have retained the silt. On the other hand, the North Saskatchewan, the Athabaska, and the Peace rivers all carry a heavy silt load, which might become quite a troublesome factor, but which should not prohibit the construction of dams along these rivers. Other papers on the programme by Messers T. D. Stanley, B. Russell, and G. L. MacKenzie (see *The Engineering Journal*, Sept. 1948) deal more adequately with water power development in Alberta.

Irrigation

The utilization of water for irrigation is just as important or more so, than the use of water in hydro-electric development, when one considers the long-range view. Dr. George Spence in a recent article on " Soil and Water Conservation on the Prairies " notes that water is liquid gold on the prairies. The productivity of the soil in large areas on the plains east of the mountains depends on moisture, which, if not obtained by rainfall, must be obtained by irrigation. Fortunately a body of thought has been built up in the form of the Prairie Farm Rehabilitation Administration, backed up by many engineers within The Engineering Institute of Canada. It is agreed that to maintain and increase food production across the prairies, water must be supplied. There is no more worthy and essential national development that calls for the attention and support of the engineers in Canada, than the utilization of the water resources in the form of irrigation.

History paints a grim picture of what has happened in many parts of the earth in the past 4000 years, largely due to neglect by man in not understanding and observing the laws of nature. Geology and geography indicate that deserts are young. Most deserts in the northern hemisphere are post-glacial and have formed within the last 10,000 or 15,000 years, when the Sahara was still covered with grass. There were no extensive desert regions in earlier geological time. Most desert areas have developed since the appearance of man. It has been pointed out that man can initiate desert conditions within a single generation. The invention of irrigation is placed in Babylon about 4000 B.C. The district around Irak with its fertile soil was at one time the granary of the ancient world, but is now a desert.

Great cities like Babylon and Ninevah flourished under a primitive but efficient system of irrigation canals between the Euphrates and Tigris, until wars and neglect destroyed the canal system and today the country is barren. Some in central Canada may say such examples are in Asia and Africa and Australia, but desert conditions cannot occur here. Without suggesting undue alarm, those desert conditions do occur in some parts of North America, and can develop in central Canada. Geographers have pointed out that the deserts on the high plateau of Tibet are comparable to those in Arabia or Libya, so that such waste conditions are not defined by latitude or by altitude.

An appeal is directed to engineers to be broadminded and far-sighted in the agricultural development of central Canada. Alberta is different today from what it was a few years ago when the mastodon, that hairy mammoth, travelled south just east of Banff, and nature can change the present surface conditions in the future. Co-operation is suggested between the engineer, the agriculturist and the scientist on some long-range irrigation programme, and more efficient use of our water resources.

Underground Water Supplies

The other phase of our water resources is the underground water supply. Altogether too little attention has been given to underground water resources under the plains east of the mountains, especially in Alberta. There are large areas in Alberta, where the future settlement and development will depend as much on the underground water supply, as on the fertility of the soil and the surface relief.

There is a lack of appreciation of the simple fact that surface water must be permitted to enter the underlying unconsolidated mantle or into the bedrock to produce an underground water supply. If surface water in sloughs and lakes is drained from the surface, or if the forest cover is removed, then the underground water supply will become depleted. The lack of underground water adjacent to the Peace River is largely because the valley of the Peace is over 700 feet deep and water cannot be stored up in the rock above the present level of the river.

There are problems on the development and production of underground water that are engineering in character and require the attention of the engineer. Even the E.I.C. can contribute by its support and by discussion on water problems through the *Journal*.

Minerals

Mineral resources are quite different from all other natural resources. The formation or occurrence of minerals is completely independent of the forest, soil and water resources. Mineral deposits have been formed slowly, in some cases requiring millions of years, and even geologic periods. Furthermore, mineral deposits are *exhaustible resources* because when developed by mining, they are gone forever and cannot be replaced. Mineral resources in any form are not unlimited, no matter how extensive the deposit may be, or how large the " mountain of ore " may appear to be. When a ton of coal is removed from the seam, or a thousand barrels of oil, or a million cubic feet of gas are produced from a well, those deposits have been depleted in that locality for all time by the amount removed.

Naturally, conservation has a somewhat different significance when applied to mineral resources. The situation is *use all you require, but waste none.* In any free country the slogan should be to develop and produce from the storehouse of mineral wealth, to the economic limit of local, national or international market, but reduce to a minimum the wastage on the surface or in the underground deposit. It is stated that the best opinion on mineral conservation "advocates foresight in the use of resources, employing the best techniques and the most efficient organization of production to reduce wastes" (Staley ②). The policy of *hoarding* of mineral resources is not favoured.

Coal Resources

Alberta is commonly referred to as a fuel province primarily, because coal, petroleum and natural gas comprise most of the mineral production to date. Other mineral resources in abundance are salt and gypsum. These five mineral products comprise the principal resources of Alberta.

Coal was discovered in Alberta in 1791, and mining has been carried on since 1872 when the first mine was opened at Lethbridge. The coal deposits are so widespread that by many, they are considered to be inexhaustible. Of course, this is not the case, as much coal is lost by mining operations. Dr. A. E. Cameron, former Deputy Minister of Mines for Nova Scotia, has stated that practically all of the coal mines in Nova Scotia, particularly in the upper levels, have left over 40 per cent, probably over 50 per cent of the coal underground to disintegrate and deteriorate. In Alberta the loss in coal mining has been of a similar order. Under the plains of Alberta where two or more seams occur close together, if the upper seam is not mined first, the coal in this seam may become unmineable by the removal of the coal from a lower seam. There is the natural tendency to mine the most profitable coal seam, although this may mean that it may be impossible to recover the higher coal later.

According to the Report of the Royal Commission on Coal, 1946, Alberta contains about 48 per cent of the coal reserves of Canada. The coal reserves in Alberta are given as, "mineable coal" about 48,000 million tons and "recoverable coal" about 24,000 million tons. To date approximately 100 million tons have been produced and possibly an equal amount rendered unmineable. The fact that there is a large coal reserve does not justify undue wastage. It is a fact that in some fields, the more accessible and more easily mined better rank coal is becoming depleted rapidly. Nevertheless the coal deposits of good quality are sufficiently large that it remains for the scientist and the engineer and the technologist to develop new uses for coal that cannot be mined profitably as fuel in the natural state.

Petroleum Resources

The petroleum resources will be discussed by others on this programme, so will be referred to briefly in this paper. Petroleum was discovered on Cameron creek near Waterton Lake about 1886. Production dates from May 1914 when Dingman No. 1 well was "brought in" in Turner Valley. The total production in Alberta to date amounts to about 100 million barrels, valued at about $170 million. Much of this has come from Turner Valley, but other fields include Taber, Conrad, Princess, Vermilion, Lloydminster, and Leduc where the discovery well was "brought in" on February 13, 1947 by the Imperial Oil Limited. There are now 60 producing wells in this new field.

The early history of Turner Valley, prior to the establishment of a Conservation Board, is not a pleasant one to relate. A small oil recovery was obtained from a tremendous flow of wet gas. As there was no market for the gas and no conservation control, Alberta lost by burning about 503 billion cubic feet of natural gas between 1929 and 1934. This represents an average daily wastage of about 344 million cubic feet.

The natural gas resources in Alberta are known to be large, but are not inexhaustible. It is estimated that in three fields only, namely, Turner Valley, Viking-Kinsella, and Medicine Hat-Redcliff, there is a proven reserve with estimated potentials of 1,500,000 million cubic feet. There are known to be undetermined gas reserves in several other parts of Alberta.

It has been suggested that natural gas from Alberta should be piped eastward at least as far as Winnipeg. However, the Honourable N. E. Tanner, Minister of Lands and Mines, has announced that the Alberta Government is not yet convinced that the reserves are sufficiently large to exceed what can be economically utilized within Alberta by industrial development in the near future. The Government of Alberta is fully cognizant of the importance of conservation of both natural gas and petroleum resources. The Alberta Petroleum and Natural Gas Conservation Board, constituted by "The Oil and Gas Resources Conservation Act" in 1938, is carrying out the policy of conservation fairly and efficiently.

The engineer who is familiar through the literature with the trend of scientific research on the processing of natural gas and the production of many by-products, must appreciate the importance of natural gas conservation, even in a country where the gas reserves might be considered by some to be *unlimited.*

The Tar Sands

It is just 160 years since Peter Pond first mentioned the extensive bituminous sand deposits of northern Alberta, which are exposed along the sides of the valley of Athabaska River for about 65 miles downstream and 40 miles upstream from McMurray. The proven area underlain by bituminous sands is over 10,000 square miles. Estimates on the content of the oil contained in these deposits range upward from 100,000 million barrels to over 250,000 million barrels of oil. The deposits are immense and represent one of the important potential undeveloped natural resources of Alberta.

Dr. K. A. Clark, professor of Mining Engineering, University of Alberta, who has carried on and directed extensive research on these bituminous sands since 1920 under the auspices of the Research Council of Alberta, sums up briefly the potentialities of these immense deposits in these words, "The conversion of heavy oils into high yields of gasoline is now a matter of every day commercial operations. There is no particular technical obstacle in the way of using the bitumen content of the bituminous sands as a crude oil. and this use must be placed along with that of road materials for present consideration. Which offers the best opportunity for commercial deelopment is a matter almost entirely of economics."③ The construction of a separation plant for test purposes by the Alberta Government at Bitumont, 41 miles down the Athabaska from McMurray, has just been completed and, according to Honourable N. E. Tanner, the plant is expected to be in operation in June or July, with an output of 35 barrels per day.

Salt Resources

The salt industry in Alberta has become one of the major industries. The production of common salt in Alberta began about twenty years ago, by Industrial Minerals Ltd., when, at a depth of 723 feet, a continuous bed of pure salt 211 feet thick was proven by drilling at Waterways on the Clearwater River, which is the north terminal of the Northern Alberta Railways Company, about 240 miles northeast from Edmonton.

In the search for oil in central Alberta, east of Edmonton, salt beds were encountered by drilling at Elk Point, Vermilion, Beaverhills Lake, Provost, at some of the deeper wells drilled in other localities, and also at Unity, Saskatchewan, close to the Alberta boundary. A tremendous deposit of salt has been proven to occur in east central Alberta.

The Alberta Salt Company has just completed the erection of a plant at Elk Point, close to the North Saskatchewan River, about 11 miles east of Edmonton. There are three beds of salt, totalling about 1000 feet in thickness, which occur between depths of 3000 and 4500 feet below the surface. At Unity, Saskatchewan, an important bed of potash occurs associated with the salt. According to L. H. Cole④, a low potash content was found in the salt at Provost and only a trace of potash occurs in the salt beds at Elk Point. With extensive deposits of salt, it will now be necessary to consider the development of the various chemical industries made possible by these deposits in Alberta, where there is an abundance of electric energy, gas and coal.

Miscellaneous Non-Metal Resources

The youngest industry in Alberta, only a few months old, is the manufacture of rock wool from shale. The plant of the Rock-Wool Products Company is situated on the Banff highway, about one mile west of Exshaw. It is reported that the rock wool produced is of good quality. There is no scarcity of suitable rock within the mountains and in other parts of Alberta, so this industry is likely to increase.

Alberta has an abundance of gypsum. Hundreds of millions of tons of gypsum rock are known to occur in two deposits. One deposit outcrops in the Peace River valley between Fort Vermilion and the mouth of Peace River. Another large deposit of pure gypsum occurs at the north boundary of Jasper Park, 35 miles north of the Canadian National Railways at Devona, 21 miles east of Jasper. Transportation is the major factor in the development of these gypsum deposits in the near future.

Other minerals known to occur in small quantities include talc, at the head of Redearth Creek, west of Banff; phosphatic beds around Banff, at Sundance canyon and in Spray valley adjacent to the golf course and used in the construction of the Banff Springs Hotel; phosphate rock also occurs in Crowsnest Pass near Coleman and at several other places within the mountains in Alberta; magnetic iron sandstones at Burmis and Pincher Creek; bentonite at Drumheller and elsewhere in Alberta, used for drilling muds in oil well development; fuller's earth in the north hill within the city of Calgary; pumacite at several localities; silica rock of pure quality near Pipestone Pass, north of Lake Louise; similar material in the North Saskatchewan valley, east of the Jasper-Banff highway; silica sand at many places throughout Alberta; brick and tile clays are widely distributed east of the mountains and throughout the length of Alberta; possibly some white pottery clays in the Cypress Hills area; pebbles for ball mills, etc. Some of these occurrences are worthy of investigation, before the economic importance of the small deposits are known.

There are no known deposits of metallic minerals of importance in Alberta, and the geology is not favourable for the formation of metallic minerals as ore bodies. In the northeast corner of Alberta, north of Lake Athabaska, there are Precambrian rocks, but no mineral deposits have yet been found in this area. Of course, there is some flour gold as placers along parts of the rivers, from the North Saskatchewan River northward, but the quantity is very small. Small pockets of sulphide ore have been found at a few places in the Rocky Mountains, but the quantity is insignificant. These occurrences include lead and copper at Silver City, now Castle, at the base of Mt. Eisenhower; copper at Simpson Pass; and zinc in Boom Mountain at Eldon. A mineral occurrence does not indicate a mineral concentration.

Conclusions

In this paper no attempt has been made to include all of the natural resources such as scenery and playgrounds in which Alberta abounds. The natural resources are varied, some are immense in known reserves, some are exhaustible and require adequate conservation consideration, others are replaceable or renewable, but the best use should be made in the development of any of the raw materials.

The main thesis presented in this short discussion is that the different natural resources are all directly or indirectly related one to the other, and the development of any one may have an immediate or a long range effect on other resources. The engineer by his training and application is best equipped to understand and appreciate the interrelation of the various natural resources. More consideration should be given by the engineer to the future effect, regionally and nationally, of the present methods and rate of development and use of any of the natural resources. His considered opinion can become a valuable guidance to industry and to governments in the most effective development and conservation of all natural resources.

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SAMUEL FORTIER
PIONEER IN SOIL MECHANICS

by

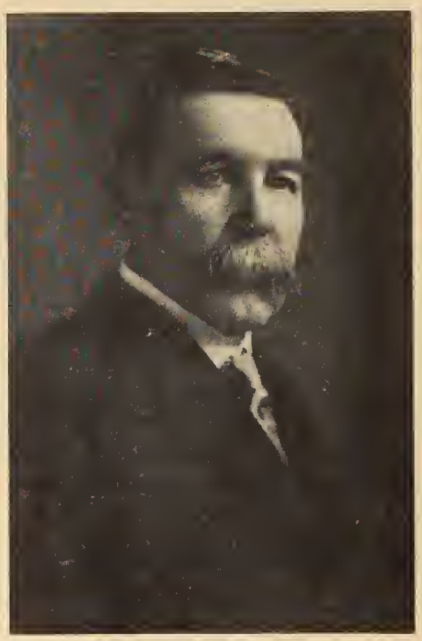
Robert F. Legget, M.E.I.C.

Director, Division of Building Research
National Research Council, Ottawa

"For . . . the construction of earth dams the physical and mechanical properties of soils are of much more importance than their mechanical ingredients. It is not essential that we know the amount of potash, etc. . . . but the size and weight of the grains, the amount of air space they enclose, the percentages of air and water contained in these open spaces, and the effects produced by moisture, heat and frost as well as the action of such forces as gravity, capillarity and evaporation are of great importance. . . . Success of works of this character rests mainly upon the fact that they were designed and built in accordance with an intimate knowledge gained from a close study. . . . of the physical properties of the materials."

This quotation might well be an extract from a recent paper dealing with rolled earth dams, so closely is it in accord with the modern viewpoint regarding the use of soils for this construction purpose. Strange as it may seem, it is from a paper written more than 50 years ago for the Canadian Society of Civil Engineers, (now the Engineering Institute of Canada), and published in the Transactions of that Society. It was reprinted in *The Canadian Engineer* in August 1896. The paper earned for its author the Gzowski Medal, the highest award of the Society. The author was one of the pioneer irrigation engineers of North America—Dr. Samuel Fortier.

Dr. Fortier was born at Leeds, Quebec, on April 24th, 1855. Graduating from McGill in 1885, he later received his Master's degree from the same university in 1907. Emigrating to the Western States, he was engaged three months on railroad survey work for the Denver-Rio Grande Railway; following this he spent three years as first assistant engineer for the Denver Water Company. In 1890



Samuel Fortier.

he became engineer and superintendent of the Ogden City Water Works.

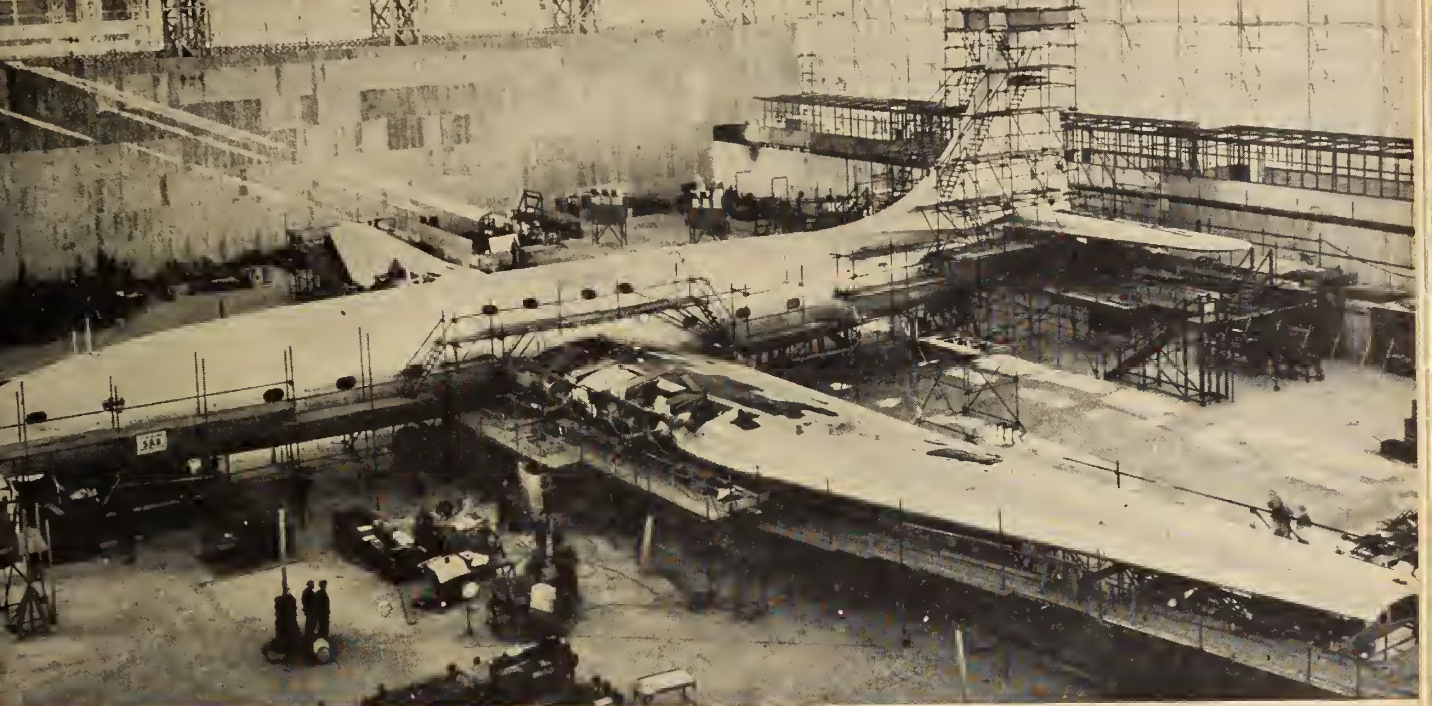
Dr. Fortier continued his work at Ogden for the next nine years, and during this period he carried out his experimental work on the properties of soils. He designed and constructed several earth dams and thus gained actual experience in the handling of soils on construction work. He also served from 1893 to 1898 as professor of civil and hydraulic engineering at the Agricultural College of Utah; he was also irrigation engineer in charge of the Experimental Station of this college. At the same time, he held corresponding positions in the Montana College of Agriculture and its Engineering Experiment Station. He also carried out hydrographic investigations for the U.S. Geological Survey in Northern Utah, Southern Idaho and Montana, and acted as consultant for a variety of other water works undertakings in the same region.

In July 1900 he began his long connection with the United States Department of Agriculture as agent for irrigation investigations in Montana. While assistant professor of irrigation at the University of California, he simultaneously directed the work in California of the Division of Irrigation of the Department of Agriculture. In 1907 he was made chief of this Division, and in 1921 became associate chief of the Division of Agricultural Engineering, now the United States Bureau of Agricultural Engineering.

After 1918 the Irrigation Division's headquarters were moved to Berkeley, California, where Dr. Fortier remained in charge until his retirement. His association with the University of California was resumed in 1924. From that year until he retired in 1931 he was consulting professor of irrigation investigations and practice. He died at his home in Berkeley on August 17, 1933.

Dr. Fortier was a pioneer in the establishment of irrigation projects in the West. Until relatively recently there was scarcely an irrigation project of any importance in that part of the continent which

(Continued on page 93)



The
Bristol Brabazon Airliner

From A Report Supplied By

A. E. Russell

Chief Designer, Bristol Aeroplane Co. Ltd., Bristol, England.

The Brabazon takes its name from England's first certified pilot Lord Brabazon of Tara. A piston-engined version, the Brabazon I, is expected to fly early in 1949 and a second gas-turbine-powered model, the Brabazon II, is under construction. The two aircraft are exceeded in size only by the American Hughes Hercules Flying Boat.

Power Plant

The Mark I is powered by 8 Bristol Centaurus engines—18 cylinder radial sleeve-valve piston engines, each delivering 2500 b.hp. for take-off, and installed in a novel paired arrangement. The two engines of each pair are angled inwards to drive a common reduction gear. The front and rear halves of each contra-rotating propeller are independently driven and controlled and if one engine of any pair is stopped its own propeller element can be feathered while the other engine continues to drive the remaining element. The Bristol Proteus propeller gas turbines of the Brabazon II are similarly arranged except that the reduction gearing is of a free-wheeling type, and stoppage of one turbine of a pair will disengage that engine, with the remaining Proteus driving the complete eight-bladed contra-rotating propeller.

Flying Controls

There were some very interesting conditions encountered in the design of the power operated flying controls. In aircraft as large as the Brabazon, the forces necessary to operate the controls are beyond the physical capacity of the pilot and the two common means of assistance are aerodynamic servo tabs or power relays. After an intensive programme of research the latter were selected for the Brabazon and particular attention was paid to duplication of components of the system to ensure absolute reliability at all engine speeds and conditions of engine failure. The added weight of the power units is fully offset by the elimination of

Fig. 1, above, shows the Brabazon, almost structurally complete, in one bay of the Assembly Hall having its many items of equipment installed.

Fig. 2, above left. October 1946. Frames in way of the inner wing are complete and the inner wing spars are located in the jig. Note the tubular bracing of the interspar ribs and front spar.

Fig. 3, above right. December 1946. This view gives a good idea of the amount of room available on the forward main deck. Note the method of blending the ends of the stringers as their numbers are reduced to match reduced bending stresses.

mass-balance weights in the control surfaces.

The effect of vertical gusts on an advancing wing is to change the angle of attack and the air forces on the wing. For every wing there are critical combinations of forward speed, rate of growth of gust velocity, and natural frequency of wing vibration which can produce local accelerations of as much as 16g. resulting in overbending and structural failure. In large aircraft such as the Brabazon the natural frequency of the wing may become as low as two or three cycles per second and, at this frequency, for the Brabazon, the critical forward speed is less than 300 miles per hour—or within the design cruising speed range. Dangerous vibrations could be avoided by altering course to avoid gusts, (often indicated by cloud formations) by reducing speed, or by designing a stiffer wing at the cost of increased weight. All these remedies have adverse affects on range and payload.

In the Brabazon the problem has been met by a principle of " gust alleviation " which involves changing the effective angle of incidence of the wing so as to meet the gust at a constant angle of attack. The ailerons are connected through the power operated control system to a pitch meter in the nose of the aircraft. Signals from the meter induced by up or down gusts then cause the ailerons to move in unison to reduce the lift of the wing for an up-gust or increase it for a down-gust. Although the pitch meter is about 80 feet ahead of the wing tip, the rate of response required in the ailerons is about 60 degrees per second and only a power operated system can provide such a high rate.

Air Conditioning

The demands of the human element on the Brabazon's designers were more exacting than those of the machine and this may be one of the reasons why the design of civil aircraft has lagged in Britain where concentration has been entirely on military aircraft during the war. It is one thing to accommodate a crew of super-men or even a large number of carefully selected, trained, and disciplined troops and to transport them long distances with only the bare necessities of life. It is a very different matter to convey a random selection of fare-paying passengers, unused to hardships, noise, and boredom at the standard of luxury they are entitled to expect for a trans-Atlantic fare of perhaps $400.00. They must be supplied with fresh air at the rate of one pound each per minute and this air must be maintained at the pressure temperature and humidity they are accustomed to find in their own homes. Pressurization to sea level atmosphere is perhaps not necessary but the apparent altitude of the cabin should never be allowed to exceed 8000 feet. For an aircraft cruising at 35,000 feet this means that a cabin differential pressure of 8 lb. per sq. in. must be maintained. This not only produces in the body structure of the Brabazon a hoop tension of about 1000 lb. per in. run, but also requires the total leakage area in the whole of the 6500 square feet of body surface to be not more than 1 square inch, otherwise excessively large blowers will be needed. This has to be achieved in the Brabazon by sealing 600,000 rivets 4,000 feet of plate joints and 400 feet of periphery of doors and windows.

To avoid stuffiness the total rate of circulation of air in the cabin must be about three times the rate of fresh air intake so the air is recirculated and must therefore be filtered and purified, and in particular, odours from the galley and dressing-rooms must not leak back to the passenger saloons. The relative humidity must not fall below a minimum of 25 per cent, or sleeping passengers will wake up with sore throats and cracked lips. Since at 35,000 feet all the moisture has been frozen out of the atmosphere, a very considerable quantity of water must be carried in the aircraft for humidification alone, apart from that needed for drinking, cooking and washing purposes. Complementary to the air-conditioning system is a fibre glass lagging which prevents excessive transference of heat and noise through the cabin walls. Although this material is the lightest ever made the amount needed to cover the inside of so large a body represents an appreciable weight penalty.

Accommodation

Passengers on first-class airliners need about four times the amount of space that they could tolerate in emergencies and the Brabazon I is designed to carry a maximum complement of 100 passengers plus a flight crew of seven and five stewards or air hostesses—112 persons in all. The wing passes through the body just below the centre line and the section within the body is pressurized to accommodate most of the switchgear and equipment associated with the extensive electrical supply systems. The main deck over the wing is extended fore and aft to provide space for a dining saloon seating 32 passengers at tables, together with the galley, pantry, cocktail bar, and lounge. At each end, stairways lead down to the main saloon and to the very ample dressing rooms and toilet accommodations located fore and aft of the wing under the dining saloon deck.

The saloon forward of the wing is devoted to first-class sleeping compartments for 36 passengers arranged on either side of the central gangway. The beds are quickly convertible for day use into seats. The saloon aft of the wing can be similarly arranged if required but present plans are to furnish it with 32 seats having a wide range of adjustment from an upright to a fully reclining position.

Electrical System

The considerations involved in the electrical design are interesting. In a medium sized aircraft the usual supply is 29 volts d-c which gives a favourable cable weight over the short distances involved. In large aircraft where circuit lengths increase to 100 feet and more, much higher voltages are necessary. The choice seems to lie between 115 volts d-c, and 208 volts, 3-phase, 400 cycle a-c. Higher d-c voltages are not advisable because of the difficulties of quenching a d-c arc. On the other hand, complications arise in the balancing of a-c loads and maintenance of constant frequencies. Alternating current generation has the great advantage that brush and commutator wear at high altitudes are not involved and this trouble is a major cause of unserviceability with d-c generators. There is also the possibility of using sturdy squirrel-cage motors, requiring no maintenance, at most points where rotary or linear actuation is required. Although cable size is reduced by the use of higher a-c voltages it should be remembered that 4 wires are required for a 3-phase supply instead of 2 or 1 for d-c depending on whether or not ground return is employed. There is little to choose on the score of cable weight but a-c switchgear however is generally rather heavier than that required for d-c.

In the Brabazon, a compromise has been reached whereby simple engine-driven alternators supply 3 phase current at 208 volts to frequency-insensitive loads such as propellor blade de-icing (a major load) and fluorescent lighting. This accounts for about 140 kilowatts and the remaining 15 kilowatts of the total electrical load is distributed as 29 volts d-c through step-down transformers and metal rectifiers which also charge storage batteries for engine starting and emergency services. In all, there are about 750 circuits with an aggregate installed cable length of more than 40 miles, about 700 of these circuits carrying the direct current. In view of the variation of ground supply at different air fields throughout the world, d-c starter motors are installed on the inboard engine which then drive the alternators through the accessory gear boxes at sufficient speed to start the remaining engines which are equipped with 3 phase a-c. Thus heavy duty d-c cables are reduced to a minimum length.

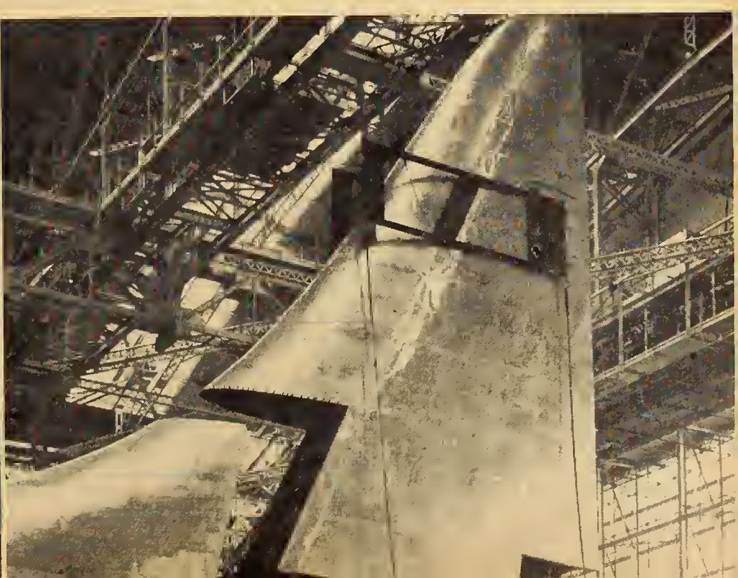
Leading Particulars

Following are some interesting statistics:

PERFORMANCE	Economical cruising speed	250 m.p.h. at 25,000 ft.	
	Operating ceiling	25,000 feet	
DIMENSIONS	Span	230 feet	
	Length	177 feet	
	Height	50 feet	
WEIGHTS	Structure	91,000 lb.	31.93%
	Power Plant	38,000 lb.	13.33%
	Removable equipment	26,000 lb.	9.12%
	Fuel & oil	95,000 lb.	33.34%
	Miscellaneous	11,000 lb.	3.86%
	Net payload	24,000 lb.	8.42%
		285,000 lb.	100%
	Max. landing weight	240,000 lb.	
	Wing loading	54 lb./sq. ft.	

Fig. 4, below left. October 1947. The Brabazon has been lowered on to its temporary undercarriage and wheeled backwards a few yards to bring the starboard main wheels on to a turntable set flush in the floor. The whole assembly is being pivoted through 90 deg. and at this point there is less than twelve inches clearance between the port tailplane tip and the end wall of the hangar.

Fig. 5, below right. November 1947. The giant vertical fin is lifted into position. Its apex is 50 feet above ground level, but the attachments were so perfectly matched that the operation took less than an hour to complete.



Notes on Management

"Transition in Corporate Controls". This is the title of an article in the September number of *Advanced Management* by Professor Joseph M. Juran of New York University.

Professor Juran took, as his text, an advertisement of the American Telephone and Telegraph Company, over the signature of its president, Walter S. Gifford. The message contained in the advertisement was that Management in the Bell System no longer represents the owners, but is entirely professional and therefore is in the position of Trustee, whose business it is to see that all the parties concerned — Capital, Labour, Management and the Public — receive consideration and equitable treatment.

Professor Juran paraphrases and condenses the advertisement in the following manner: "You owners may take a seat by the fire; we managers know what's best for you, for labour, and for the customers; we have taken over."

The change from ownership control to management control has been proceeding steadily for a number of years and has given rise to a good deal of discussion among economists and others interested in the control of business.

The situation in Canada was analyzed and placed on the record in the report of the Royal Commission on Price Spreads, 1935. This work was well done by one of our leading economists but the process has gone far beyond the conditions pictured there.

Seven years ago James Burnham (in his book, "The Managerial Revolution"), drew attention to the changes taking place. Like many other authors, Burnham ventured into the field of prophecy and some people did not like what he foretold. His book does contain, however, a very good exposition of the existing trends.

To revert to the subject of the relation and responsibility of Management, it has been pointed out many times that there is no inherent reason why Management should be appointed by the owners. There is no reason why Labour should not hire Management and Capital; or why Consumers should not unite and hire all three of the other factors. This is what has happened with some of the British Co-operatives.

The A. S. M. E., at their annual meeting in New York in the month of December, staged a panel discussion on the subject. According to people who heard it this was the highlight of their management sessions, which are always significant. We may expect to hear more of it.

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The writer of these notes recently participated in a meeting where the subject was Selection and Training of Executives. The first part of the subject was handled in what might be termed a normal manner, but when the speaker turned to the Training of Executives he soon launched into Semantics. Questioned about the sources of information in this field he mentioned "Science and Sanity" by Korzybski. Some of our readers who wish to try their teeth on something tough might tackle "Science and Sanity."

These remarks are not intended to be facetious as most of those present were greatly intrigued by the possibilities which the speaker envisaged. The core of his message was that people working together are influenced by the total situation — physical conditions, human relations, predispositions, group dynamics, and what have you. When we try to simplify things too much by saying: "He had his orders, why does he not obey them?" we ignore some of the most important factors in the situation. Training should enable executives to realize the existence and the importance of factors frequently overlooked. As was said above we shall probably hear more of it anon.

A news despatch from Ottawa says that an extensive programme of organization is being undertaken in various Government departments. It is also reported that they are looking for people experienced in this field. It is to be hoped that they find the right ones.

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The latest number of the *Journal of Advanced Management* reviews three books on Quality Control. This indicates the growing importance of, and attention being given to, this field. The mathematicians and statisticians have made their contribution and it is now up to the production men to work out the application of these methods to every-day situations. Where production quantities are large the problem has been largely solved but there is still a lot of necessary work to be done in the application of these methods where the production quantities are relatively small.

Incidentally in a lecture recently where Quality Control was the subject one member of the group said he had never heard of it outside the term inspection. The thesis developed by the lecturer was that to obtain Quality Control it was necessary to start at the very beginning, i.e., with design, and at every step on the way to production of the finished article, to ask the question, "Does this manner of doing this conduce to good quality in the product?" Many readers will appreciate how unfamiliar this conception is and how far-reaching would be the effects of its adoption.

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Professor Schell of Massachusetts Institute of Technology was in Montreal recently addressing the local chapter of N. O. M. A. Professor Schell is a member of the International Programme Committee of C. I. O. S. and while he was here Dr. Austin Wright and Messrs. Dion and Peachey had a lengthy conference with him regarding the programme for the Regional Conference in Quebec in May. These three gentlemen are also journeying to New York to confer with members of the Programme Committee of the National Management Council on the matter. Nothing but the best is good enough for this Conference.

J. A. C.

Report of Council For the Year 1948

Together with Committee and Branch Reports

It has become a custom to open this report with statements on the increased membership and the increased activities of the Institute. It is a pleasant privilege to be able to continue this custom for the account of the year 1948.

The year's end saw the membership record broken again, not only in the total figures but in the rate of increase. As shown by the Roll of the Institute given in detail later in this report, the total has now reached 10,878. New names added to the roster amounted to 2,075 which is 841 more than have been added in any previous year.

Once again there has been a great gain in Students and Juniors. The number of transfers to more senior grades has been most encouraging—a total of 741. It is interesting to know that the new by-law which transfers Students automatically to Junior has been wholeheartedly supported by Students. The year's record shows that 89 per cent of those so transferred have continued as Juniors. Great credit is due the Membership Committee of 1945 for devising these new methods.

New Branches

Further indication of expansion and increasing usefulness is shown by the development of new branches. Petitions for two new branches were received and granted during the year—one at Kamloops, B.C., to be known as the Central British Columbia Branch, and one in Newfoundland. The former was inaugurated in January 1949 with President Finlayson presenting the charter, and the latter will be inaugurated early in 1949. This brings the total to thirty.

At the time of writing another branch is in prospect in Ontario. Exploratory meetings were held there in December and there is every reason to expect that an application will be forthcoming shortly.

Annual Meeting

In the opinion of those who attended, the 1948 annual meeting at Banff was the most pleasant and successful of all meetings. The disastrous floods kept many members at home who had planned to be there, but even with that the attendance reached almost 650—a very gratifying figure. The professional programme was lengthened from the usual two days to three days. There were seventeen professional sessions. It was proven conclusively that the best background for such a meeting is a hotel with adequate accommodation restricted solely to those registered for the meeting.

Branch Officers Conference at Banff

For the second year the officers of branches were invited to conduct a conference on matters of prime importance to the branches. The conference was well attended and the deliberations occupied many hours. It was the wish of the branch officers that the conference be an annual affair and that more time be set aside for it.

Student Conference at Banff

For the third successive year undergraduate representatives of all Canadian universities at which engineering degrees are given, were invited to meet during the Institute's annual meeting. Like its predecessors this was a successful affair. Representatives were there from every institution from Vancouver, B.C., to Halifax, N.S.

Headquarters

The increase in Institute activities as described in the various parts of this report, has had noticeable repercussions at Headquarters. To meet the impact of increases in membership, transfers, branches, employment operations, library services, committee activities, etc., it has been necessary to increase the clerical staff somewhat. These increases added to already crowded premises have resulted in a state of congestion that is not conducive to the best results.

It is evident that if the Institute is to continue its policy of expansion in size and usefulness, additional office space must be found, either by appropriating some of the rooms now used for the membership in general or by securing space outside. Both possibilities are being examined by the House Committee.

Members who read in other sections of this report that over 2,000 new names were added to the membership list in 1948, that almost 750 transferred to more senior grades, that, in the library, books borrowed have increased by over 2,000, that in the employment service there were over 1,000 interviews, that the number of branches has increased by 10 per cent—these members will appreciate that Headquarters may well have growing pains.

Tribute must be paid to the work of the staff. It is doubtful if a more efficient, loyal group could be found in any office. They bring to their work a zeal that is unusual and which is reflected in the results obtained. In every department the work requires the acceptance of responsibility and the sacrifice of long hours of overtime. The Institute is most fortunate (and the General Secretary in particular) in having the services of these intelligent, industrious and pleasant people. Their work is reflected in the success of all phases of the Institute's activities.

Roll of the Institute

The membership of all classifications now totals 10,878, which again is a record. New names added for the year 1948 amounted to 2,075, but deaths, resignations and removals reduced the net figure to a gain of 1,719.

During the year 2,064 candidates were elected to various grades of membership. These were classified as follows: Members, 173; Juniors, 48; Students, 1,842; Affiliate, 1. The elections for the previous year totalled 1,085. Eleven reinstatements were effected. Life Membership was conferred on 44 members under the revised By-law 26.

Transfers from one grade to another were as follows: Junior to Member, 211; Student to Member, 1; Student to Junior, 527; Junior to Affiliate, 2, a total of 741.

Removals from the Roll

There have been removed from the roll during the year for non-payment of fees and by resignations, 110 Members; 122 Juniors; 43 Students, and 7 Affiliates, a total of 283.

Deceased Members

During the year 1948 the deaths of 73 members of the Institute, including one Honorary Member, have been reported as follows:

HONORARY MEMBER

Mead, Daniel Webster

MEMBERS

Allan, J. Lorn
Ambrose, John R. W.
Amos, Louis Auguste
Anderson, John Marshall
Beugler, Edwin James
Brooke, John
Brown, Robert Arthur
Burns, William
Canning, Dow Vernon
Casey, William
Cooper, Frank W.
Cothran, Frank Harrison
DeBlois, Howard Crawford
Dowling, Harry Lawson
Durley, Richard John
Dyer, Frederick Charles
Finnie, Oswald Sterling
Flay, William Henry George
Flint, Charles
Fuller, Harold Paul
Garner, Albert George
Groves, F. W.
Jamieson, William Turnbull
Jeffrey, Edgar William
Kelley, William Henry
Kindersley, Robert
LaMountain, George William
Leydon, Thomas F.
LeCointe, P. P.
Lessard, C. Camille
L'Hoir, Georges A.
Love, Edwin Reginald
McClintock, George Arthur
McCort, Cecil Roy
MacDonald, James Campbell
Macdonell, C. K. S.
McDougall, George K.
MacGowan, Andrew R.
MacNab, S. D.
McPherson, Fred G.
Malcolm, William Lindsay
Martin, Edward Byron
Matthews, Benjamin Frank
Miles, Edgar S.
Miller, William Miles
Misener, John S.
Munro, Alan H.
Needlands, Ernest Wesley
O'Donnell, John Gerard
Parker, Burton Leigh
Patten, Roy Hamilton
Porter, Cornelius James
Powell, W. H.
Price, Malcolm Mackay
Sheppard, Norman E. D.
Stadler, John
Stone, Ernest A.
Talbot, Charles
Thomson, W. Chase
Tighe, James L.
Waddell, Neil M.
Walker, William
Warnock, Robert Nicholson
Walcott, Richard Lewis
Weeks, Otis
Williamson, David Allen
Wolff, Martin
Worthington, William Robert

JUNIORS

English, William John
Tetreault, Armand Jean

STUDENTS

Evoy, Joseph Alfred Gilles
Marchionni, Dante Aldo
Rousseau, Gerard

Total Membership

The membership of the Institute as at December 31st, 1948, totals 10,878. The corresponding number in 1947 was 9,159.

	1947	1948
Honorary Members	20	19
Members	5,075	5,288
Juniors	1,924	2,166
Students	2,049	3,318
Affiliates	91	87
	9,159	10,878

Respectfully submitted on behalf of the Council.

J. N. Finlayson, M.E.I.C.,
President.

L. Austin Wright, M.E.I.C.,
General Secretary.

Legislation Committee

Your committee has studied all matters of legislation likely to affect the interests of the Institute and of its members, and again reports progress.

Thus ends another fruitful year with an ideal ever present:

"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

Respectfully submitted,

J. A. Beauchemin, M.E.I.C.,
Chairman

Employment Department

In all phases of the work—interviews, placements and correspondence — the year just past was an exceptionally busy one for the department. The activity exceeded that of 1947, and vacancies still are in excess of the number of applicants available for employment.

This trend was noted in last year's report and it was pointed out then that no long-term forecast could be made on how long this condition would prevail. However, industrial activity remained high in 1948, and there is reasonable expectancy that the high volume of work handled will not abate in 1949. Volume alone, is not the gauge of success but rather satisfactory placement, both from the engineer applicant's viewpoint and that of the firm concerned. It is heartening to know that this has been obtained in a marked degree throughout the year.

The Employment Bulletin, introduced at the close of 1947, has proved its effectiveness as a means of informing all members on employment information well in advance of its publication in the *Journal.* This bulletin, which is mailed at the beginning of each month, has proved particularly helpful to firms seeking suitable applicants among those listed in the "Situations Wanted" column

There were 1,054 interviews recorded during the year 1948, and known placements totalled 158. As in previous years, it is certain that placements actually exceeded that recorded figure, but the department's reports are based on first-hand information, and can only be reported on that basis.

There were 525 new job files opened in 1948. At the end of the year applicants' files still open totalled 140.

In connection with the classified advertisements, it has been necessary in fairness to the many who wish to use this free service, to limit the number of insertions to three; for both situations vacant and situations wanted. Thus, when an advertisement does not appear for a fourth time, it does not mean necessarily that the situation has been filled or the applicant is no longer available. The file is kept open as long as needed, and the department will continue to answer all queries regarding it.

Still foremost in demand are the junior members of the profession. Large groups of engineering students continue to graduate from Canadian Universities. The service is planning to devote special attention to the matter of securing employer contacts for 1949 graduates, but the effects of this study will not be evident until late in 1949. The Institute and university authorities are maintaining close relations in all matters concerning employment opportunities for engineering students.

While the senior professional group is slightly more difficult to place satisfactorily, good progress was made in 1948.

Correspondence from overseas diminished slightly, but personal interviews, especially with British engineers recently arrived in this country under the accelerated immigration scheme, increased noticeably. Again, many satisfactory placements were effected among these new Canadians. The Institute, however, has kept its policy the same in this respect; it will help those who are resident here, but does not actively encourage engineers to leave other countries and come here on a speculative basis.

In general 1948 has been noteworthy not only for the proportion of successful placements, but in the further expansion of contacts. The membership increase in the Institute has reflected itself in the work of the department, and many new firms have used the service for assistance in filling vacancies. Certainly the burden of work has increased, and it has been most gratifying to receive letters from both employers and members alike expressing their appreciation of the department's efforts.

Respectfully submitted,

(Miss) J. Summers,
Employment Service

The Engineer in the Civil Service

The activities of this committee during 1948 have been along similar lines to those of previous years, namely, maintaining a watching brief over any action which might affect the engineer in the civil service, and constantly keeping before the Commission and those dealing with the activities of the engineer, the material previously presented in our various briefs before the committees and commissions dealing with matters affecting the engineer in the civil service.

Late in the year the committee sent a letter to The Hon. Louis St. Laurent, now Prime Minister, strongly supporting the action of the Professional Institute of the Civil Service in requesting the appointment to the Civil Service Commission of an engineer with "recognized scientific knowledge and administrative ability". This matter is at present before the Government. We have also recommended the appointment of an engineer to the International Joint Commission, which matter is still under advisement. These are a few of the activities of your committee during 1948, and it appears as if the results can only be judged by a long term view over the years.

N. B. MacRostie, M.E.I.C.,
Chairman.

Publication Committee

Members will have noted changes in the *Journal* during 1948 which the committee believes have been acceptable to the membership. Paper has been easier to obtain and although it has been necessary to pay particular attention to rising costs, the *Journal* has been printed on paper of sufficiently good and lasting quality to achieve a high standard of printing and reproduction of illustrations—an important factor in the presentation of technical papers.

A good deal of attention has been given to layout to present *Journal* material to the members in an attractive and readable form. This imposes a slight penalty in paper consumption which your committee believes can be readily justified.

In spite of substantial increases in advertising rates effective throughout the year, the *Journal* rates are again somewhat below the average for comparable business and technical journals in Canada and further increases in printing costs are imminent. In spite of printing costs being fifty per cent higher than in 1946 and 1947, the balance sheet for the *Journal* shows some improvement over the previous year and it is hoped that further improvement may be achieved in 1949. Intensive efforts have been made in Canada and the United States to bring to the attention of industrial advertisers the value of the *Journal* as an advertising medium.

The Branch Officers Conference at the annual meeting last year recommended to Council that the *Journal* should be thoroughly investigated to determine whether adequate coverage of the entire engineering field can be achieved by a single publication. The Publication Committee has been asked to carry out this investigation and the branch chairmen have been asked to act on a larger general survey committee. Acceptances have been received from the majority of the branch chairmen and at this writing the Publication Committee is compiling a brief which will present the complete picture for the consideration of branch executive and general meetings.

Because of the intense activity in all branches of engineering, the *Journal* has been well supplied with papers — the problem has been to obtain sufficient advertising revenue to meet the high cost of publishing the papers without too great a charge on the general funds of the Institute.

Respectfully submitted,

C. E. Gelinas, M.E.I.C.,
Chairman

Membership Committee

Early in 1948 in response to the instructions of Council, the committee prepared a proposal with regard to means by which the membership of the Institute could be increased in every branch. This was sent to Headquarters on January 22nd.

Throughout the year there were some conversations and exchange of correspondence with Headquarters and eventually it was agreed that the programme proposed originally be confined on an experimental basis to one branch.

It still remains for some small details to be worked out and for the basic list of prospects to be prepared by Headquarters.

It is hoped that by the end of 1949 the experiments will have been completed and if successful will have been applied to all of the branches across Canada.

H. R. Sills, M.E.I.C.
Chairman

Papers Committee

The members of this committee have largely taken care of any requests for papers in their respective provinces.

In Alberta there have fortunately been ample speakers throughout the year, and, generally speaking, all branches have had very good meetings and satisfactory papers. As far as papers and programmes go, practically all branches have had a better year than for several years in the past.

There is, therefore, nothing of a specific nature to report except progress and a successful year.

Respectfully submitted,

S. G. Coultis, M.E.I.C.,
Chairman.

Canadian Standards Association

The C.S.A. has completed another very active year in all its departments.

Under the main heading of Preparation of Standard Specifications, the Association has published twenty-eight new specifications during the year, reaffirmed nine, and has done a great amount of work on new projects and revisions of existing specifications necessitated by changes and developments in practice. Thirty entirely new projects have been started apart from those referred to above as completed and published, and fourteen of these latter are in civil engineering. The policy of review and revision has resulted in one hundred and four standard specifications being restudied by the respective committees in addition to those already readopted after such study. Much work has been done under the Canadian Electrical Code, Parts I, II, III, IV and V, and also under Non-ferrous Metallurgy.

At the Annual Meeting held in December a few revisions to the by-laws were adopted after study and recommendation by the appropriate subcommittee, these being designed to clarify procedure, to cope with the developments in organization and to expedite work.

A great deal of satisfactory progress has been made with the Welding Bureau which has grown in numbers and influence during the year. The Bureau now includes 112 Members, of which 75 represent fabricating firms and the other 37 sustaining Members, that is to say, firms interested in some aspect or other of the general welding procedure. A large proportion of the member firms have now been certificated as fully approved under the code and this work, which is the prime object of the Bureau, is being carried on as expeditiously as practicable. An important new development is the work of instruction both by correspondence course and by practical training, which the Bureau has undertaken. This course is partly designed to train supervisors, draughtsmen and engineers, but also permits of a certain amount of practical instruction to those who wish to secure it. Co-operation with educational societies has been established and lectures have been delivered under the auspices of the Bureau in Montreal, Toronto and Hamilton. In many cases these lectures have been recorded so that they may be repeated mechanically in other centres. A library on welding has been established, the nucleus of which was obtained from the Lincoln Foundation who presented some 200 books to the Bureau. The Administrative Board has been increased during the year and the financial situation has been definitely improved, so much so that the Bureau is now self-supporting.

The Electrical Approval subdivision of the Association has suffered financially from the restrictions placed upon imports during the year which resulted in the diminution of applications for examination of machinery and other electrical products. The laboratory staff had been enlarged during 1947 to cope with the increased volume of work and as much of this testing work was projected into 1948, the costs of operation could not be cut down to correspond with the reduction in new business. The Administrative Board reports that the rising costs have kept ahead of revenue and that even increases in fees have not made it possible to meet the situation raised by the falling off of applications. Apart from this circumstance which is beyond the control of the Board, the Approvals Division has been fully engaged in meeting its primary demands of rendering an inspection and approval service as efficiently as practicable.

The Association has maintained certain of its overseas connections such as its membership in the International Organization for Standardization and the International Electro-technical Commission, thus keeping in touch with developments in other parts of the world and is continually in close touch with standard organizations in the Commonwealth and in the United States.

Respectfully submitted,

P. L. Pratley, M.E.I.C.,

Representing E.I.C. on Main and Executive Committees.

Ontario Division

The activities of the Ontario Division during the year 1948 have been limited for a variety of reasons to organizational and planning work. The executive of the division have not consolidated the organization and membership and have made plans for more comprehensive activities in the year 1949.

Two meetings were held during 1948. The first coincided with the Regional Council Meeting in Toronto on October 2. The Statutory Meeting of the Executive was held in Hamilton, December 15.

During the year two items were considered by the executive of the division and further discussions during the coming year will be necessary before submission of final reports. These items were:

1. Toronto Branch Brief to Council
2. Toronto Branch Memorandum re Collective Bargaining.

Dr. A. E. Cameron's report on Soil Erosion has been presented to the division for action during 1949. An immediate survey of all Ontario Branches concerned with shoreline erosion will be made.

Officers for the forthcoming year were duly elected at the December meeting of the Division and are as follows:

Executive Committee:

Chairman......J. R. Dunbar, Hamilton
Vice-Chairman..W. L. Saunders, Ottawa
Secretary.....L. C. Sentance, Hamilton
Treasurer.........G. R. Turner, Ottawa

Board of Management: J. R. Dunbar, W. L. Saunders, L. C. Sentance, G. R. Turner, E. A. Cross, F. R. Pope, C. P. Warkentin.

Respectfully submitted,

L. C. Sentance, M.E.I.C.,
Secretary.

Library and House Committee

Two meetings of the committee were held during the year 1948. As for the last two years, the center of attention has been the need of additional space at headquarters. Plans for an extensive re-modeling of the present quarters, chiefly affecting the auditorium, and a new building to replace the older part of the building facing the street were prepared during 1947 and a continued study of this proposal carried on during the past year. Tentative discussions were held with the Finance Committee with the resulting opinion being that the cost of such a development was much too high, both as to capital cost and ensuing carrying charges.

The whole general scheme of providing additional space at headquarters was discussed at some length with Council in the latter part of the year. It was felt that a very thorough study should be made with the long range view chiefly in mind as to what building accommodation should be considered. Preliminary investigation of present conditions and how they will fit into, say, a 25-year programme of Institute activities, will be carried out by H.Q. staff. It is felt that the entire Institute membership should be made aware of the serious congestion now existing and how it is hampering and curtailing very worthwhile activities which would be of very definite value to every member. Efforts will be made to acquaint all members of the present situation since any expense involved in providing better, or completely new H.Q. facilities, will rest in the hands of the members generally. Since it may not be possible to delay some relief to present congestion for much longer, the committee will continue to study plans for a temporary expansion, the cost of which may be reasonable.

On the request of the Montreal branch, a study was made regarding the application of Public Address System in the auditorium at H.Q. This matter has been referred back to the local branch for further consideration.

During the past summer routine repairs and improvements were carried out. The repairs to headquarters steps were completed without altering the design or rendering them out of harmony with the existing architectural motif of the building.

LIBRARY

The Library now consists of approximately 13,410 volumes, including text books, reference books, periodicals, transactions, etc.; some 2,475 feet of shelving, and 51 vertical file drawers.

New material including text books, transactions, periodicals, etc., but excluding pamphlets, bulletins, and miscellaneous items, to the value of $2,421.00, has been added to the Library during 1948.

Accessions	1948	1947
New Books	202	228
Proceedings and Transactions	48	82
Reports and Bulletins	445	447
Standards and Tentative Standards	104	90
Pamphlets	169	152

We take this opportunity of thanking the publishers and reviewers for their very excellent co-operation during the past year. Reviews, book notes, and abstracts, numbering in all 418, have been published in *The Engineering Journal* during 1948, an increase of 170 over 1947. By publishing reviews and notes of new books in the *Journal,* we bring new publications to the attention of our readers, and also acquire considerable new material for the Library, thus serving a two-fold purpose.

Although no new films have been added to the film collection, some very comprehensive film catalogues have been acquired which will facilitate the compiling of subject bibliographies of films.

Use made of the Library has again shown a substantial increase over the previous year, especially insofar as the borrowing of material is concerned, as the following statistics indicate.

Days Open	272	270½
Evenings Open (5 to 8 p.m. Thursdays — winter months)	22	24
Inquiries Received:		
By Phone	2,791	2,531
In Person — Day	1,693	1,468
— Evenings	176	124
By Letter	1,399	1,229
Total	6,059	5,352
Increase 707 or 13.21 per cent		
Circulation:		
Books Borrowed	1,562	1,347
Periodicals, etc., Borrowed	2,375	1,821
Pamphlets Borrowed	1,054	811
Inter-Library Loans Borrowed	77	36
Indices Consulted	1,011	*
Films Borrowed	6	5
Total	6,085	4,020
Increase 2,065 or 51.36 per cent		

* Not recorded.

New Borrowers Added	226	180
No. of Borrowers as of Dec. 31st	265	113
Special Services:		
Bibliographies Prepared	101	95
Pages	211	236
Photostat Orders	29	26
Prints	182	177
Orders for Members	318	270

The work of reorganizing the Library is progressing, but very slowly. The new Library Regulations published each month in the Library Notes of *The Engineering Journal,* and the new system for handling library deposits have facilitated the work considerably.

Work has been begun on the new subject classification, using U.D.C. (Universal Decimal Classification) as published in abridged form in English by the British Standards Institution as BS 1000A:1948. The text books received since 1946 have been classified. This new file must be revised and corrected before the balance of the Library can be classified into it. Unfortunately, time and space are still very much at a premium.

In fact, lack of space is the great enemy of progress, necessitating, as it does, constant rearrangement of shelv-

LIBRARY REGULATIONS

Hours

	Oct-May	June-Sept
Mon-Fri	9–6	9–5
Thurs (Oct-Mar)	9–8	9–5
Sat (closed Jy-Aug)	9–12	9–12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

Indicate which required
Be specific

Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

Non-members may consult the library, but may not borrow material.

ing space, filing on the floor, discarding material worthy of being kept, loss of time (and tempers), and in general, making advancements and improvements all but impossible.

We wish to draw to the attention of members the Library Regulations printed herewith.

The Library is for the use of the members. Inquiries and suggestions are most welcome.

The committee expresses its appreciation of the work of the staff during the past year. It is hoped that practical steps may be developed in the near future to make that work easier.

Nominating Committee

Chairman: John R. Kaye

Branch	*Representative*
Border Cities	C. G. R. Armstrong
Calgary .	H. B. LeBourveau
Cape Breton	W. S. Wilson
Central B.C.	H. L. Cairns
Cornwall	C. I. Bacon
Edmonton	F. R. Burfield
Halifax	G. J. Currie
Hamilton	I. M. Macdonald
Kingston	M. N. Hay
Kootenay	A. C. Ridgers
Lakehead	J. M. Fleming
Lethbridge	A. J. Branch
London	E. R. Jarmain
Moncton	R. L. Parsons
Montreal	W. Sharples
Niagara Peninsula	W. D. Brownlee
Ottawa	Norman Marr
Peterborough	A. L. Killaly
Quebec	C. H. Boisvert
Saguenay	B. E. Bauman
Sarnia	G. R. Henderson
Saskatchewan	E .K. Phillips
Sault Ste. Marie	R. A. Campbell
Saint John	F. P. Vaughan
St. Maurice Valley	J. H. Douglas
Toronto	A. E. Berry
Vancouver	P. B. Stroyan
Victoria	A. L. Carruthers
Winnipeg	T. E. Storey

Admissions Committee

The committee held monthly meetings preceding each meeting of Council. Admissions or transfers were recommended for some 340 members not including 77 admitted under cooperative agreements, 1,842 student memberships and 516 automatic transfers from Student to Junior.

Mr. H. S. Van Scoyoc, M.E.I.C., undertook to prepare a manual for the guidance of the Admissions Committee and the branches. Considerable useful information was accumulated during the year and is being correlated with previous experience to establish a set of precedents for the appraisal of future admissions and transfers. It is expected that this manual will be available during the current year.

The by-laws concerning automatic transfer of Students to Junior member grade and mandatory transfer to full member grade are proving satisfactory in their application.

The committee would like to accord its appreciation of the work of the Headquarters staff which made possible the handling of such a large number of applications.

Respectfully submitted,

C. A. Peachey, M.E.I.C.,
Chairman

Committee on Professional Interests

Continued contact has been maintained with all branches of the Institute throughout the year. Again, as in 1947, nearly all branches and several provincial professional associations were visited by members of the committee, and advantage was taken of opportunities, during the trip West for the Annual Meeting at Banff, to establish new contacts in the Western Provinces. Several members of the committee attended the Maritime Professional Meeting at St. Andrews, N.B., in September.

The 75th anniversary of the founding of L'Ecole Polytechnique de Montreal—the oldest engineering school in Canada—was recognized suitably by the Institute, and a representative of the committee attended, as a guest of honour, the principal function marking that event.

Active contact was maintained with American Founder Societies. Under the aegis of our joint agreement with the ASME, a meeting of the Joint Committee took place in New York in December, every member being present. Matters discussed at length were:

(a) Service to student organizations;

(b) Participation of Institute members in research work of ASME committees;

(c) Reciprocal privileges of members in attendance at regional or annual meetings of each organization.

It is expected that some benefits to Institute members will result from conclusions reached during these discussions.

During the year the President and General Secretary of the Institute attended the meeting of the ASCE in Seattle. The committee believes that the Institute's decision to hold the 1950 Annual Meeting coincident with the ASCE meeting in Toronto will strengthen the relationship between these two organizations.

Reciprocal privileges between members of the Institute and of the British Institute of Radio Engineers were established during the year similar to those enjoyed by the British Institutions of Civil, Electrical and Mechanical Engineers. A similar arrangement is now being discussed by the General Secretary with the Institute of Aeronautical Sciences and the Royal Aeronautical Society.

No further action was taken concerning the recommendation of the Canadian Construction Association to the Federal Government in regard to preparation of a shelf of plans and specifications for public works, curtailing of public works at times of full employment, and improvement of salaries of engineers and architects in government service in order to attract and retain competent personnel. The committee believes that the matter is of considerable importance and it will be reviewed at an opportune time.

Representations to the Federal Government concerning the removal of duties on engineers' plans ended unsatisfactorily and your committee is of the opinion that further effort should be made to convince the appropriate authority that the engineers' complaint is justified.

The change in the annual fee of the Institute authorized by ballot in 1946 necessitated changes in the co-operative agreements with the provincial associations in Nova Scotia, New Brunswick, Saskatchewan and Alberta. The necessary amendments were approved by the respective governing bodies and the documents were signed late in the year.

The ever-growing membership of the Institute has brought about conditions in certain sections of the country permitting the formation of new branches through which members could be better served and more scope given to Institute activity. Several new branches are now being contemplated. It is a particular pleasure to record the application from members in Newfoundland to this end and it may be that by the time of the next annual meeting Newfoundland will have been admitted as a province and a branch established there. The first steps have been taken towards establishing a branch in the Kitchener, Ontario, area and a new branch has been authorized with headquarters in Kamloops, B.C.

Respectfully submitted,

J. B. Stirling, M.E.I.C.,
Chairman.

Committee on Employment Conditions

In its last year's report your committee pointed out the possibility of having Bill No. 338 passed in the House of Commons during 1948. At that time this Bill dealing with Industrial Disputes included engineers in its definition of an employee.

This legislation was again presented to the House in 1948 under Bill No. 195 with a revision however, excluding engineers from its scope. Council approved this revision at one of its general meetings and confirmed this attitude at a subsequent meeting when the dissenting opinions of some branch executives were submitted.

Your chairman visited the Peterborough branch executive to explain Council's policy and to present the problem involved in all its aspects.

He also attended a general meeting called by the Toronto branch where a general discussion took place after the Institute's and the Ontario Federation of Employee-Engineers' views were presented.

Legislation was passed approving the parliamentary committee's recommendations with few alterations, and it is to be reported that the engineering profession, while retaining the right to bargain voluntarily, has been excluded from the scope of the Industrial Disputes Act.

It should be kept in mind that when Council decided to support the proposal for the exclusion of engineers from collective bargaining legislation, they assumed a liability to do by other means everything possible to aid the young engineers in the improvement of their employment conditions.

It is recommended to Council that special attention be given to the economic status of the profession, especially to the young engineer's financial remuneration in governmental and industrial positions.

It is further recommended that special liaison be maintained with the provincial registration bodies' committees on collective bargaining in order to coordinate all efforts in this direction.

Respectfully submitted,

G. N. Martin, M.E.I.C.,
Chairman

Treasurer's Report

The audited statements of Assets and Liabilities and of Revenue and Expenditure for the year ended December 31st, 1948 are submitted herewith:

Income from membership fees shows an increase of $6,449.45 or approximately 9% as compared with the previous year.

Revenue from publications shows an increase of $37,718.37 or 66% over 1947 while expenditure is up $34,179.72 or 62%, due principally to higher printing costs. Profits from publications amounts to $10,407.78, an increase of more than 50% over the previous year, but it should be kept in mind that this favourable showing is due largely to the inclusion of the $2.00 subscription taken out of the fees of Members and Juniors.

The Building Fund was increased by $4,000 and now stands at $9,000. An amount of $1,500 has been placed in a new Technical Publications Fund. The total surplus for the year, before deductions for these two funds, amounts to $6,766.09. Total assets now stand at $113,563.25, an increase of approximately 8.5% over 1947.

The securities in the Institute's investment accounts amounting to $51,431.07, and having an approximate market value of $52,251.00, have been checked and found in order. During the year the Institute purchased $2,000 Hydro-Electric Power Commission of Ontario 3% bonds at $99.50 and sold $200 Dominion of Canada 4½% due 1958 (called in November 1948).

An effort should be made to increase the building fund at a rapid rate as Headquarters is overcrowded and something should be done to alleviate the situation.

The excellent showing during the year reflects great credit on the General Secretary and his staff.

Comparative Statement of Revenue and Expenditure

For the Year Ended December 31st, 1948

Revenue

Membership Fees:	1948	1947
Arrears	$ 3,860.86	$ 3,187.23
Current	71,569.92	65,793.10
Advance	1,778.86	1,180.78
Entrance	1,789.34	2,148.42
Compounded fees	......	240.00
	$ 78,998.98	**$ 72,549.53**
Publications:		
Journal subscriptions	$ 16,624.28	$ 14,834.22
Journal sales	58.65	55.00
Journal advertising	78,252.85	42,328.19
	$ 94,935.78	**$ 57,217.41**
Income from Investments	$ 1,158.19	$ 1,145.64
Refund of Hall Expense	895.00	670.00
Sundry Revenue and Profit on Sale of Securities	194.04	860.43
Total Revenue for Year	$176,181.99	$132,443.01

Expenditures

Building Expenses:	1948	1947
Property and water taxes	$ 1,349.82	$ 1,349.82
Fuel	649.09	725.03
Insurance	233.66	203.72
Light, gas and power	428.19	495.83
Caretaker's wages and services	1,367.00	1,188.00
House expense and repairs	1,422.25	1,786.27
	$ 5,450.01	$ 5,748.67
Publications:		
Journal salaries, printing and sundry expenses	$ 84,528.00	$ 49,891.36
By-laws and Code of ethics	......	456.92
	$ 84,528.00	$ 50,348.28
Office Expense:		
Salaries	$ 30,681.13	$ 24,909.59
Telegrams, postage and excise	2,778.44	2,719,19
Telephones	966.23	1,040.31
Office supplies and stationery	7,537.87	5,621.18
Audit and legal fees	600.00	1,315.00
Messenger and express	115.99	184.22
Miscellaneous expense	683.71	599.58
Depreciation—furniture and fixtures	522.23	503.00
	$ 43,885.60	$ 36,892.07
General Expense:		
Annual and professional meetings	$ 3,355.60	$ 2,260.50
Engineering Council of Professional Development	......	958.85
Community planning	......	749.04
Students conference	1,450.15	822.21
Meetings of council	755.76	811.86
Travelling	4,761.20	1,482.16
Branch stationery	210.53	193.10
Institute prizes	498.50	538.85
Library salary and expense	4,635.01	3,697.99
Interest, discount and exchange	190.26	226.50
Committee expenses	313.00	1,039.88
Cost of membership in other organizations	709.28	945.52
Sundry expense	717.94	721.99
Pension plan	3,107.60	1,384.92
	$ 20,704.83	$ 15,833.37
Rebates to Branches	$ 14,847.46	$ 13,810.89
Total Expenditure	$169,415.90	$122,633.28
Transferred to Reserve for Past Services Pension Fund	......	8,000.00
Transferred to Building Reserve	4,000.00	......
Transferred to Technical Publications Fund	1,500.00	......
Surplus or *Deficit* for Year	1,266.09	1,809.73
	$176,181.99	$132,443.01

Respectfully submitted,
R. E. Heartz, M.E.I.C., *Treasurer.*

Finance Committee

During the year the revenues of the Institute have increased due both to a further increase in membership and to the increased advertising rates for the *Journal.* On the other hand, operating costs have continued to increase, as in all other lines of business.

Advertising revenue and *Journal* expenses, as shown in this year's statement, cannot be compared directly with those items in previous reports. This year's statement shows a gross revenue received for advertising including commissions, and commissions are included in the cost of publication. In previous years, the net revenue for advertising was shown and advertising commissions did not appear as an item of expense in our statement. Also in 1948, advertising commissions for thirteen months have been paid in order to make our advertising year conform to the financial year.

The overall financial position of the *Journal* has improved month by month, and it is expected that 1949 should show continued improvement.

During the year a further payment of approximately $1,500 was made from current revenue on account of our liability for past service benefits under the Pension Plan.

At the December meeting of Council, the Finance Committee was requested, if possible, to set aside out of this year's surplus a sum to assist in publishing more technical papers in 1949. Your committee, therefore, has set aside out of the year's surplus the sum of $1,500 for this purpose, and they also placed an additional $4,000 in the Building Fund.

The Finance Committee met regularly and reported to Council at each of its meetings during the year.

R. S. Eadie, M.E.I.C., *Chairman.*

Comparative Statement of Assets and Liabilities

As at December 31st, 1948

Assets

	1948	1947
Current:		
Cash on hand and in banks..........	$ 6,914.20	$ 3,021.84
Accounts receivable — less reserve..	8,739.77	6,082.43
Arrears of fees — estimated........	3,500.00	2,500.00
	$ 19,153.97	$ 11,604.27
Investments at Cost................ (Approximate market value as at 31st December 1948 — $52,251.00)	51,431.07	49,621.07
Sundry Advances....................	350.00	662.55
Deposit with Postmaster...........	175.00	175.00
Prepaid Insurance..................	260.00	428.10
Gold Medal.........................	45.00	45.00
Library—At cost less depreciation......	1,448.13	1,448.13
Furniture and Fixtures—At cost less Depreciation	4,700.08	4,523.62
Land and Buildings—Assessed Valuation	36,000.00	36,000.00
	$113,563.25	$104,507.74

Liabilities

		1948	1947
Current:			
Bank overdraft—current account.....		$	$ 453.33
Accounts payable.....................		6,665.41	5,618.68
Rebates to Branches.................		1,000.00	700.00
Unexpended balance of Rehabilitation Fund.........................		......	181.63
		$ 7,665.41	$ 6,953.64
Special Funds:			
As per statement attached...........		17,711.95	17,134.30
Reserves:			
Building fund.......................		9,000.00	5,000.00
Building maintenance...............		2,000.00	2,000.00
Contingent reserve..................		5,000.00	5,000.00
Pension fund reserve................		8,000.00	8,000.00
Technical publications fund..........		1,500.00	......
Surplus Account:			
Balance as at 31st December, 1947..............	$ 60,419.80		
Add: Excess of revenue over expenditure for year as per statement attached	1,266.09		
Increase in estimated arrears	1,000.00		
		62,685.89	60,419.80
		$113,563.25	$104,507.74

Audit Certificate

We have audited the books and vouchers of The Engineering Institute of Canada for the year ended 31st December 1948 and have received all the information we required. We have verified the cash in banks and the investment securities and the revenue therefrom. In our opinion, the statement of assets and liabilities and statement of revenue and expenditure for 1948, as attached, are properly drawn up so as to exhibit a true and correct view of the Institute's affairs as at 31st December 1948 and of its operations for the year ended that date, according to the best of our information and the explanations given to us and as shown by the books.

(Sgd.) RITCHIE, BROWN & CO.,
Chartered Accountants.

Montreal, 20th January, 1949.

Statement of Special Funds

As at 31st December 1948

Leonard Medal Fund:		
Balance as at 31st December 1947....	$ 605.08	
Add: 3% interest..................	17.52	
	$ 622.60	
Less: Cost of prizes................	21.00	$ 601.60
Plummer Medal Fund:		
Balance as at 31st December 1947....	$ 812.39	
Add: 3% interest..................	23.74	
	$ 836.13	
Less: Cost of prizes................	21.00	$ 815.13
Past Presidents' Prize Fund:		
Balance as at 31st December 1947....	$ 8,034.80	
Add: 3% interest..................	240.86	
	$ 8,275.66	
Less: Cost of prizes................	6.23	$ 8,269.43
Duggan Medal Fund:		
Balance as at 31st December 1947....	$ 2,746.06	
Add: 3% interest..................	82.38	$ 2,828.44
Julian C. Smith Memorial Fund:		
Balance as at 31st December 1947....	$ 925.18	
Add: 3% interest..................	27.40	
	$ 952.58	
Less: Cost of prizes................	12.00	$ 940.58
Fund in Aid of Members' Families:		
Balance as at 31st December 1947....	$ 3,685.88	
Add: 3% interest..................	110.57	$ 3,796.45
Pioneers of Science—Prize Fund:		
Balance as at 31st December 1947....	$ 224.91	
Add: 3% interest..................	6.75	$ 231.66
Life Members' Donations Fund:		
Balance as at 31st December 1947....	$ 100.00	
Donations for 1948..................	122.00	
Add: 3% interest..................	6.66	$ 228.66
		$17,711.95

Harry F. Bennett Educational Fund

Statement of Receipts and Disbursements

For the year ended 31st December 1948

Balance as at 31st December 1947................		$ 23,565.50
Add: Voluntary contributions during year	$ 1,315.00	
Interest on savings account....	49.21	
Interest on investments........	271.23	
Interest on loans..............	5.66	1,641.10
		$ 25,206.60
Deduct: Sundry bank charges.......	$ 9.71	
Sundry printing, etc........	24.83	34.54
Balance as at 31st December 1948................		$ 25,172.06
Cash in Canadian Bank of Commerce..	$ 4,464.39	
Investment at cost (Approximate market value $19,975.00)................	19,912.50	
Loans outstanding.....................	820.00	
	$ 25,196.89	
Deduct: Owing to Engineering Institute of Canada for expenses advanced	24.83	$ 25,172.06

Investments—*At cost:*		
$10,000.00	Dominion of Canada Bonds 3% Sept. 1, 1966..........	$ 10,037.50
10,000.00	Province of Ontario Bonds 3% Apr. 15, 1965..........	9,875.00
		$ 19,912.50

Auditors' Certificate

We have audited the books of the Harry F. Bennett Educational Fund of The Engineering Institute of Canada for the year to 31st December 1948 and have received all the information we required. In our opinion, the above statement of receipts and disbursements is properly drawn up so as to exhibit a true and correct view of the affairs of the Fund as at 31st December 1948 and for the period ended that date, according to the best of our information and the explanations given to us and as shown by the books of the Fund.

(Sgd.) RITCHIE, BROWN & CO.,
Chartered Accountants.

Montreal, 20th January 1949.

Board of Examiners

Your Board of Examiners considers that the practice of referring applicants classed as Member with examination to the provincial associations or the Quebec Corporation has continued to prove satisfactory during the past year. However, there is under consideration a submission from one of the branches questioning the advisability of this delegation of examining powers to other organizations.

The Board of Examiners has held only one examination this year, in Newfoundland, where there is at the present time no professional engineering association.

R. DeL. French, m.e.i.c.,
Chairman.

Committee on the Training and Welfare of the Young Engineer

The Guidance and Welfare of the Young Engineer falls naturally into three levels: A—The High School; B—The University Graduate; C—The Young Graduate.

At the high school level, the chief E.I.C. activity has been indirect—i.e. through its representation on the Canadian Committee for Student Guidance in Science and Engineering. This committee succeeded in getting the Department of Labour at Ottawa to agree to publish a comprehensive guidance booklet patterned on the previous E.I.C. publication "The Profession of Engineering in Canada", but considerably more comprehensive. The C.I.C., C.I.M.M., C.C.P.E. & S., Bureau of Technical Personnel, and E.I.C. all contributed in the preparation of subject matter, and the booklet will be made available to all schools, and guidance groups throughout Canada at an early date.

It is the opinion of your chairman, that guidance work at the high school level can be most efficiently handled by pooling the Institute's efforts with those of other engineering societies, and all branches have been circularized twice with this recommendation and with suggestions for its practical implementation.

At the university level, the chief activity was the conference of Undergraduate Engineering Society delegates held during the June meeting at Banff. While the conference did not produce any new recommendations, it served an extremely valuable purpose in demonstrating the Institute's sincere interest in the young engineer, at the same time giving this representative group an insight into the activities of the Institute.

At the young graduate level, activity varies widely between branches. There is definite need for additional constructive action in this area.

Two actions that are needed to put the Institute's guidance work on a better footing, are obvious, but rather difficult to carry out.

1—Each branch should be visited by the chairman or someone equally interested in this work, and an endeavour made to convince each branch of the genuine necessity of organizing for guidance work at all three levels previously mentioned. Correspondence has proved definitely ineffective. A travelling field secretary could probably care for the greater part of this chore.

2—The committee should hold one or two meetings each year. These committee meetings would, I believe, become more feasible, if the main committee were divided into two sections—"Eastern" and "Western", or possibly a greater number of regional sections. I also feel that members for the committee should be drawn chiefly from the chairmen of branch committees.

It would be helpful if my successor as chairman is regularly invited to attend council meetings. This would facilitate the obtaining of the council's sympathetic support, without which it is difficult for the committee to do effective work.

G. R. Langley, M.E.I.C.,
Chairman.

National Construction Council

The following meetings of the National Construction Council of Canada were held during 1948:

Feb. 12—This meeting considered: import of Building Materials from U.S.A.; C.C.A. Resolutions re life of N.C.C.; housing; construction costs; and invitations to other National Associations to affiliate with N.C.C.

Apr. 22—This meeting dealt with letters from C.M.A. enclosing three submissions to Minister of Finance respecting Bill No. 454 re income taxes and from the South African High Commissioner's office at Ottawa re production of vermiculite. There was discussion re shortage of pig iron with an address by Major Anthes. The meeting also considered migration of technical personnel to the U.S.A. induced by high salaries and low taxes.

May 31—The Annual Meeting—A lengthy discussion on desirability of continuing the National Construction Council—its functions and history.

June 24—Adoption of Resolution considered at the Annual Meeting re future of Council and notice thereof to the Constituent Bodies.

Aug. 19—This meeting considered a letter received by the President from Allan C. Ross, Pres., of the C.C.A. concerning their resolution to the Prime Minister of Canada and the premiers of each province re Dominion Provincial accord in the fields of fiscal policy, taxation, resources development, low rental housing, labour, health and social welfare. It also drafted reasons to be sent to constituent bodies re continuation of N.C.C. on lines followed in past. Two other items on the agenda were the budget (no changes) and the migration of technicians to U.S.A.

Sept. 3—Letter from Secretary enclosing a copy of Resolution of C.C.A. and asking for comment.

Sept. 16—Letter to Secretary from E.I.C. signed by M. McLaren re assessment.

Sept. 21—Letter from Secretary to E.I.C. re continuing Council along similar lines as in the past.

Dec. 2—This meeting was for discussion of letter from Allan C. Ross re continuing N.C.C. Also considered was a letter from E.I.C. to W. E. Bonn enclosing copy of letter from A. C. Ross to President Finlayson of E.I.C.

Dec. 6—Discussion of W. E. Bonn's reply to the General Secretary of the E.I.C.

In conclusion it is suggested that during all these Meetings, it appeared that those representing the Constituent Bodies felt that the line of action taken by the C.C.A. represented a comparatively small group who had visions that the C.C.A. could more aptly express itself directly.

It seemed to be the feeling of these representatives that it would be much more politic for C.C.A. to express itself through the N.C.C. in such matters as, for instance, Dominion-Provincial relations.

Respectfully submitted,

W. E. Bonn, M.E.I.C.,
Representative of the E.I.C.

Canadian Chamber of Commerce

Note—The Institute is a member of the Canadian Chamber of Commerce. Several members of the Institute are active in its affairs, including Dr. Arthur Surveyer who at its request has prepared this report.

The chief activities of the Canadian Chamber of Commerce during the year 1947-48 can be summarized as follows:

Expansion of the Chamber movement;
Organization of National Affairs Committees;
Participation in radio discussions;
Campaign against Communism;
Defence of Private Enterprise;
Presentation of the Chamber's views to the Federal Government;
Study with a committee of the U.S. Chamber of Commerce of questions of mutual interest.

The work of the Chamber of Commerce shows how businessmen, who could probably never be elected to parliament, can, nevertheless, by studying national problems and by making apposite recommendations, take part in politics indirectly and give to the Government pertinent suggestions.

Expansion of Chamber Movement

The Canadian Chamber of Commerce is now a federation of 568 senior and 145 junior Boards of Trade and Chambers of Commerce, with a membership of over 100,000 people earning their living in big and in little business. The campaign has resulted in the affiliation of 152 new units during the past year. This campaign was carried out in the field by the members of the staff and was helped considerably by the former president himself, Mr. Bruce Hill, who spent 50% of his time away from home on Chamber business, thus giving the movement his personal leadership.

National Affairs Committees

Committees to study national affairs were formed in the various member organizations, under the direction of Col. R. D. Harkness, M.E.I.C. This resulted in an increase of from 100 to 165 National Affairs Committees in the various communities of the country. The objectives of National Affairs Committees include the following:

a) develop a better understanding and appreciation of national problems;
b) create a better informed public opinion concerning national problems; and
c) keep the Government fully informed on the opinions and desires of businessmen throughout the country.

With this end in view, National Affairs releases were issued by the Chamber during the year, on such subjects as import restrictions, proposed federal legislation, private enterprise, communism, Dominion-Provincial tax relations, Canadian citizenship, the alternative vote, the national budget, and where the sales dollar goes.

Private Enterprise

The Chamber also presented the views of business on Canada's system of private enterprise over the radio. First, 61 independent radio stations carried for the winter months a series of recorded dramatized capsule messages of one to two minutes duration; secondly, 53 stations carried the 15 minute recorded dramatized programmes, entitled "Pattern for Prosperity"; thirdly, seven Chamber directors participated in the CBC network during the winter and spring months.

The Chamber, convinced that the system of private enterprise is the only one which will give to Canadians an adequate standard of living, has continuously attempted to demonstrate the advantages of free enterprise. This was done chiefly by means of pamphlets distributed and sold to business firms, bringing the circulation of the series to over 750,000 pamphlets. In the same way, the pamphlet entitled "The Communist Threat to Canada" and another one entitled "How Communists Operate" were distributed and altogether 85,000 English copies and 15,000 copies in French have been delivered to all corners of the Dominion.

Federal Taxes

On taxation, the member organizations were polled on federal fiscal policy and on re-examination of the federal income tax law. Based on the findings of this poll, two relevant briefs were compiled by the Chamber Public Finance and Taxation Committee, under the joint chairmanship of Messrs. K. Dalglish and Courtland Elliott. On two occasions, during the year, Chamber officers discussed with the Minister of Finance matters relating to Dominion-Provincial tax relations and to the equitable taxation of all business enterprises, whether privately or publicly owned.

Labour Legislation

After consultation with the membership and a study of the proposed new labour code, in April last, the Chamber's Labour - Management Relations Committee communicated the Chamber's views to the Industrial Relations Committee of the House.

Dominion-Provincial Tax Relations

While continuing to press for a further Dominion - Provincial Conference directed towards the removal of the confusion and uncertainty of the tax situation which now exists for business, the Chamber's members were polled on their views concerning the methods for and rights to levying of succession duties and personal and corporate income taxes. The results of this poll were inconclusive. An overwhelming majority, however, reiterated approval of the calling of a new Dominion-Provincial Conference, the payment of subsidies by the Federal Government to provinces whose tax revenues were not adequate to provide public services up to a national average, the principle of equal taxation for all forms of business enterprise and the elimination of double taxation of corporate earnings.

Canada-United States Committee

The Canada-United States Committee jointly maintained by the two national Chambers of Commerce held its 25th and 26th Meetings at Hot Springs, Virginia, and at Murray Bay, Que., in May and September, respectively. This Committee is maintained to promote close and cordial relations between the businessmen of the two countries and to afford an opportunity for the study and discussion of business problems of mutual concern. Both meetings were under the Joint Chairmanship of Mr. C. A. Bullis, of Minneapolis and Mr. D. P. Cruikshank, o.b.e., of Ottawa. Conclusions reached at this year's meetings involved action to eliminate "invisible tariffs", greater economic co-operation and trading facilities, the operation of the European Recovery Program, joint agricultural aid to Western Europe, industrial co-ordination for defence and greater uniformity in the Customs Acts of the two countries.

Annual Meeting in Vancouver

The highlight of the Chamber's 1948 activities was the Annual Meeting which took place in Vancouver from the 26th to the 28th of October. Two special trains, one from Montreal and the other from Toronto, transported more than 500 businessmen and officials of Boards of Trade travelling from eastern points to attend this meeting. Stopovers of from six to twenty-four hours were made at Winnipeg, Saskatoon, Calgary, Moose Jaw, and Regina, in order to give the delegates the opportunity to meet with western members, to discuss with them problems of mutual interest, and more particularly to formulate the Chamber's policy declarations for 1948-49. These declarations of the Chamber should carry weight with the Government since its membership now totals 100,000 businessmen. Altogether it speaks for 1,650 large and small Canadian businesses with payrolls totalling 1,500,000 workers, a very substantial proportion of the total population gainfully employed in the country.

Mr. Henry Birks, of Montreal, President of Henry Birks & Sons Ltd., was chosen to head the Chamber during the next year. He has already mapped for himself a programme of travel across the country. Mr. Birks is an admirable choice to direct the extension of the Chamber's efforts, especially in stressing the pitfalls in the theories of radical groups who would supplant the present economic system by various forms of state control.

The Chamber reiterated its opposition to Socialism but its approval of social measures when kept within reason. Mr H. Greville Smith, former Chairman of the Executive Committee, declared: "We are not opposed to social progress, but we do recognize there may be limits to the rate of progress." The Chamber is in sympathy with desires for expanding social security programmes, but believes that such goals can be achieved only if Canadian national wealth continues to increase; there are limits to the demands which can be made on our national wealth at the present time, without jeopardizing Canadian hopes for the future. A careful distinction must be made between what is socially desirable as an ultimate aim and what can be achieved without damaging the system which makes our social welfare advances possible.

The Chamber is convinced that more people get more goods under free enterprise than under any other system, and that it can be made to produce a lot more for every one. It believes that it is the only system under which individual freedom can be maintained, and that anything that is wrong can be corrected by discussion. It opposes socialism as much as communism because it knows that in both systems the final product is a totalitarian state.

Respectfully submitted,

Arthur Surveyer, m.e.i.c.

Member of the Sub-committees on "Economic Development" and on "Public Finance and Taxation".

Applied Mechanics Reviews

Most engineers and scientists appreciate the importance of keeping abreast of developments in their own particular fields of interest. They realize also the value of knowing what is going on in other branches of science and engineering, which may possibly have application to their own work. Hitherto, the only way to remain well informed has been to read the available technical journals and reports devoted to the subjects of interest. For the engineer with wide interests this has become an appalling task, not only because of the accelerated pace of development during recent years but because of the tremendous growth in the number of published papers, a vast number of which appear in technical journals that the average engineer is never likely to see. The difficulty is not reduced by the fact that the majority of such reports have become highly mathematical in character and cannot, therefore, be dismissed with a brief perusal but must be studied carefully if the contents are to be fully understood.

The American Society of Mechanical Engineers has appreciated this need for the engineer to have easy access to the literature. Early in 1948 the Society began publishing a monthly journal designed to provide a comprehensive review of the important advances as they occur throughout the field of applied mechanics. This journal, known as "Applied Mechanics Reviews", has attempted to give only up-to-date material and has tried to select for review those papers which present new theories, ideas or methods—both theoretical and experimental and new data or calculations which have general application. Seven national professional associations in the United States, The Engineering Institute of Canada, and The Institution of Mechanical Engineers (Eng.) are assisting by representation on the Advisory Board. Dr. L. H. Donnell, Illinois Institute of Technology, is Editor and Dr. Stephen Timoshenko is chairman of the Editorial Board. It is a non-profit project.

Nine issues of "Applied Mechanics Reviews" have so far appeared this year (January to September issues) and it is now possible to appraise this publication in the light of the objectives the editors set for themselves and to tell engineers who are not familiar with it something of its characteristics. In the first nine issues, 1440 reviews have been presented, which, although somewhat less than the approximate goal of 1800, represents no mean achievement in the first nine months of publication. The papers reviewed in these first issues were published in 146 engineering and scientific journals. It is obvious, of course, that the editors must have examined a far greater number of journals than this. The journals from which papers have been reviewed to date originate in Argentina, Australia, Austria, Belgium, Canada, China, England, France, Germany, Greece, Italy, Japan, The Netherlands, Poland, Rumania, Russia, Sweden, Switzerland, the United States of America, and others.

Each review is written and signed by an internationally recognized authority and, in general, is about 250 words in length. The quality is very high and a real attempt has been made to give, in concise form, the essence from each paper. One cannot fail to be impressed by the evidence of so much "behind the scenes" labour which must go into the co-ordination and production of "Applied Mechanics Reviews".

Following is a list of the sections included and the total number of reviews which have been devoted so far to each section:

Section	Total No. of Reviews
I *Mechanics of Solids:*	
General Dynamics, Kinematics, Friction	27
Gyroscopes, Governors, Servomechanisms	11
Vibrations, Balancing	51
Wave Motion, Impact, Seismology	21
Elasticity Theory	51
Experimental Stress Analysis	32
Rods, Beams, Shafts, Springs, Cables, etc.	36
Plates, Disks, Shells, Membranes	46
Buckling Problems	83
Joints and Joining Methods	24
Structures	68
Plastic Flow, Failure, Mechanics of Solid State	106
Design Factors, Meaning of Material Tests	11
Material Test Techniques	31
Mechanical Properties of Specific Materials	52
Mechanics of Forming and Cutting Processes	11
II *Mechanics of Fluids:*	
Potential or Laminar Incompressible Flow	39
Turbulence and Boundary Layer	53
Compressible Flow, Gas Dynamics	113
Aerodynamics of Flight; Wind Resistance	140
Aeroelasticity (Flutter, Divergence, etc.)	25
Propellers, Fans, Turbines, Pumps, etc.	43
Experimental Flow Equipment and Technique	30
Hydraulics; Transport of Solids; Cavitation	40
Flow and Flight Test Techniques	4
III *Heat:*	
Thermodynamics	42
Heat Transfer; Diffusion	47
IV *Miscellaneous:*	
General Theoretical and Experimental Methods	30
Acoustics	44
Ballistics; Detonics (Explosions)	26
Soil Mechanics; Seepage	31
Geophysics, Meteorology, Oceanography	36
Lubrication; Bearings; Wear	19
Marine Engineering Problems	19

In the July issue of "Applied Mechanics Reviews" about 6½ pages were devoted to a list of the periodicals from which reviews are made. This gives the full name of each periodical, its abbreviation as used in the reviews, and the city and country in which the periodical originates.

It is quite evident that "Applied Mechanics Reviews" will become indispensable as a reference work, particularly to those engaged in basic research and development and also to teaching staffs of universities. Although a large percentage of the reviews are of papers dealing with fundamental work, there are also a fair proportion of papers of immediate interest and value to the practising engineer who may from time to time be faced with specific problems of some variety. The publication will undoubtedly be highly successful in keeping engineers in close touch with developments in the various fields of applied mechanics, for the expenditure of a comparatively small time on their part. The issues of "Applied Mechanics Reviews" are arriving about two months late, but the editors hope to catch up before long. Photostatic copies of any of the papers reviewed can be obtained from the editors at 25c per page, a service which enhances the value of the publication.

Respectfully submitted,

J. J. Green, M.E.I.C.,
E.I.C. Representative
Applied Mechanics Reviews.

Canadian Radio Technical Planning Board

The fourth annual meeting of the C.R.T.P.B. was held in Ottawa on Dec. 1st, 1948. Reports were submitted by the co-ordinators and panel chairmen which indicated that lack of information in regard to the International situation had greatly retarded the technical studies considered by the various panels. It was realized, however, that a tremendous volume of work lies ahead of the board and with the inauguration for a plan for closer liaison with the work of the Department of Transport, which was approved at the meeting, it was hoped that considerable progress would be made during the coming year.

Mr. G. C. W. Browne, controller of radio, Department of Transport, was a guest of the board and addressed the meeting. He complimented the board on its work and stated that the board was one of the salient examples of co-operation between administration and industry for the better utilization of the radio frequency spectrum for the benefit of Canada. He gave a very comprehensive report on the activities of his department on various International Committees to ensure that Canada is obtaining her fair share of the available frequency channels.

The tremendous expansion in the demand for radio frequency channels is placing an ever-increasing load on Mr. Browne's organization. He pointed out that the relatively new 152-162 m.c. band for mobile communication service, with taxicabs, private cars, trucks and so on, is already congested. He emphasized that the C.R.T.P.B. and the Canadian engineers could not be satisfied with present technical progress, but must strive to improve the performance of equipment being manufactured so as to make more efficient use of the existing channels.

To give some idea of the complexity of the international frequency allocation problems, Mr. Browne explained the purpose and function of the Inter-American Telecommunication Conference held in Rio de Janeiro, the International Telecommunication and Radio Conferences held at Atlantic City, the Commonwealth and Empire Radio Civil Aviation Conferences, the International Civil Aviation Conferences and the Provisional Frequency Board. In addition to this, Mr. Browne briefly touched on the activities of eleven other International Conferences which have been held since the war and six other conferences scheduled for the coming year. He stated that Canada had been well represented at most of these conferences, the majority of which lasted for many months.

It was with regret that the board accepted the resignation of Mr. R. M. Brophy as president who had headed the activities of the board since its inauguration. The officers elected for the ensuing year at the annual meeting were as follows:

Mr. R. A. Hackbusch.......... *President*
Mr. G. W. Olive......... *Vice-President*
Mr. S. D. Brownlee. *Secretary-Treasurer*

Respectfully submitted,

A. B. Hunt, M.E.I.C.,
Institute Representative on the Board.

Prairie Water Problems Committee

At the Annual Meeting of the Engineering Institute of Canada held in Banff in 1948, the following papers were presented:

"Water Resources of Alberta—Their Present and Ultimate Uses"—by Ben Russell, director of water resources, Province of Alberta.

"The Saskatchewan River and Manitoba's Water Problem"—by D. M Stephens, deputy minister of mines and resources, Province of Manitoba.

"The St. Mary-Milk River Irrigation Project," by G. L. MacKenzie, chief engineer, P.F.R.A., Regina.

"Irrigation in Western Canada—Its Possible Effect on Industry and Population"—by A. E. Palmer, superintendent, Dominion Experimental Station, Lethbridge, Alberta.

"The Work of the Institute's Committee on Conservation and Development of the Natural Resources of Alberta"—by Dr. John A. Allan, professor of geology, University of Alberta, Edmonton.

"Hydro Power Development on the Eastern Slopes of the Canadian Rockies"—by T. D. Stanley, production superintendent, Calgary Power Ltd., Calgary.

"Forest Management on the Eastern Slopes"—by Major General Howard Kennedy, chairman, Eastern Rockies Forest Conservation Board, Ottawa.

These papers dealt with irrigation and the various intricate problems in the control and use of the waters of interprovincial streams.

Your committee also drew the attention of the Council of the Engineering Institute of Canada to the fact that the two vacancies in the American Section of the International Joint Commission had been filled by engineers, the remaining member being a lawyer, there then being two vacancies on the Canadian Section, one of which has since been filled by the appointment of the Hon. J. Alison Glen.

The year 1948 marked the retirement of Victor Meek as comptroller of the Dominion Water and Power Bureau of the Department of Mines and Resources. Mr. Meek is one of the pioneers of Irrigation in Western Canada and the present development is in a large measure attributable to his work.

Respectfully submitted,

G. A. Gaherty,
Chairman.

Julian C. Smith Medal

Carrying out the instructions pertaining to the award of the Julian C. Smith Medal for 1948, the special committee consisting of Past-Presidents J. B. Hayes, L. F. Grant, and myself, has made a selection which has been submitted by letter ballot to all councillors.

As a result the Julian C. Smith Medal for 1948 is being awarded to R. W. Diamond, vice-president and general manager and director, The Consolidated Mining and Smelting Co. of Canada, Trail, B.C.

Respectfully submitted,

J. N. Finlayson, M.E.I.C.,
Chairman.

Sir John Kennedy Medal

The Sir John Kennedy Medal for 1948 has been awarded by the Council of the Institute to T. H. Hogg, M.E.I.C., consulting engineer, York Mills, Ont.

Respectfully submitted,

L. Austin Wright, M.E.I.C.,
General Secretary.

Juniors' and Students' Prizes

The reports of the examiners appointed in the various zones to judge the papers submitted for the prizes for Students and Juniors of the Institute were submitted to Council at its meeting on January 22nd, 1949, and accepted as follows.

H. N. Ruttan Prize (Western Provinces) to A. G. Fletcher, S.E.I.C., for his paper "Draughting a Logging Topographic Map".

John Galbraith Prize (Province of Ontario) to K. R. Stehling, S.E.I.C., for his paper "Rocket Propulsion".

Phelps Johnson Prize (Province of Quebec--English) to M. B. T. George, S.E.I.C., for his paper "Preliminary Design of a Light Racing Airplane".

Ernest Marceau Prize (Province of Quebec—French) to Gerard Gascon, for his paper "Exploitation des Gisements d'Ilménite du Lac Tio".

Martin Murphy Prize (Maritime Provinces)—No papers received.

Abstracts of Reports from Branches

Note—For Membership and Financial Statements see pages 90 and 91

Border Cities Branch

During the year the Border Cities Branch held nine executive and eight general meetings. These included the President's visit as well as a joint meeting with the Detroit section of the American Society of Mechanical Engineers.

The following is a list of the general meetings held during the year. The attendance is noted in brackets.

Jan. 8—**Research of the Hydro-Electric Power Commission Ontario** by W. P. Dobson, Director of Research of the Commission. (50)

Feb. 11—Combined Ladies' Night and International Joint Meeting when members of the Border Cities Branch were guests of the Detroit section of the American Society of Mechanical Engineers. (200)

Mar. 12—**Recent Developments in the Uses of Aluminum** by Gordon Black, Manager of the Sales Development Division of the Aluminum Co. of Canada. (55)

Apr. 9—**The Mining, Smelting and Refining of Nickel-Copper Ore,** a film supplied by the International Nickel Co. of Canada Ltd. (40)

May 14—**Materials Handling Equipment** by T. M. Harris, The Yale & Towne Mfg. Co. (39)

Oct. 6—President's Visit—Dean J. N. Finlayson, University of B.C. (90) (The ladies were present at this meeting)

Nov. 12—Student Night—Two papers were presented: **Chemical Treatment of Wood** by Alex McCaw, S.E.I.C., and **Cold Water Heating Systems** by Paul Valade, S.E.I.C. (53)

Dec. 10—**Conservation of our Natural Resources,** a series of films presented by The Carling Conservation Club. (34)

Calgary Branch

The following list gives the activities of the Calgary branch for the period December 1, 1947 to December 1, 1948. The attendance at meetings is indicated in brackets.

The Executive Committee met 11 times during this period, with an average attendance of eight.

The highlight of the past year was the Annual Meeting of the Institute held at Banff, June 1 to 5, when Calgary was the host branch.

Dec. 11—Symposium on **Oil and Gas Production and Processing** by G. A. Connell, JR.E.I.C., Chief Petroleum Engineer, Royalite Oil Co.; H. W. Newby, Br. Aff., Meterman, A. G. A. Piercey, Chief Chemical Engineer, J. W. Young, M.E.I.C., Asst. Field Superintendent, all of the Madison Natural Gas Co. Ltd. (82)

Jan. 8—**Manufacture and Applications of Lubricating Oils and Greases** by C. R. Shablitzke, Manager, Automotive and Industrial Lubrication, McColl-Frontenac Oil Co. Ltd. Also a colour film dealing with the Persian oil fields. (74)

Jan. 22—**Farm Electrification** by F. T. Gale, M.E.I.C., Superintendent of Rural Electrification, Calgary Power Ltd. (98)

Feb. 19—**The Joint Use of Poles by Electric Power and Communication Utilities** by D. G. Geiger, M.E.I.C., Transmission Engineer of the Bell Telephone Co. of Canada, Western Area, Toronto. This was a luncheon meeing. (49)

Feb. 21—Annual Ladies' Night was held at the Renfrew Club. Dancing, bridge, buffet supper, refreshments and entertainment. (134)

Mar. 1—Special luncheon meeting. **Why Manage the Resources** by Robson Black, President, Canadian Forestry Association. (59)

Mar. 4—**Trolley Coach Operation and Overhead Construction** by R. H. Wray, JR.E.I.C. (now M.E.I.C.), Electrical Engineer, Calgary Transit System. (63)

Mar. 13—Annual Meeting of the Branch. Installation of officers.

Mar. 19—Joint dinner meeting with the A.P.E.A. and the C.I.C. at the Palliser Hotel.

Oct. 7—Two films: **Colonel Crompton**—dramatizing the work of the famous British engineer, by courtesy of Bepco Canada Ltd.; and **Beyond the Pylons** showing the manufacturing of wire, cable, and meters. (68)

Oct. 21—**Bulk Handling of Grain and Other Materials** by J. M. Fleming, M.E.I.C., President and General Manager, C. D. Howe Co. Ltd., Port Arthur. (51)

Nov. 6—Afternoon plant visit: Choice of the refinery of the Imperial Oil Ltd., or the plant of the Alberta Nitrogen Department of the Consolidated Mining and Smelting Co. of Canada Ltd. (53)

Nov. 18—**Stabilization of the Sunnyside Hill Slides** by Dean R. M. Hardy, and a related paper on **Electro-Osmosis** by Professor J. A. Harle, Head of the Dept. of Electrical Engineering, both of the University of Alberta, Faculty of Engineering, Edmonton. (109)

Cape Breton Branch

The following Dinner Meetings were held during 1948:

May 12—Annual Meeting — Installation of Officers, followed by movies. (27)

Sept. 2—Presidential Visit of Dean J. N. Finlayson. (29)

Cornwall Branch

A very successful year was enjoyed by the Cornwall Branch. Our Civic Affairs Committee has been very active. and two of our Members were appointed to the City Planning Board. The ladies were invited to attend a tour of the Canada Mill of Canadian Cottons Limited.

The Cornwall Branch met seven times during the year with an average attendance of six. The following General Meetings were held during the year with attendance as shown in brackets:—

Jan. 20—**Pre-stressed Concrete Pipe**—an illustrated lecture by R. M. Doull, Manager of the Preload Company of Canada and Canada Gunite Company. (35)

Feb. 17—**Power Development on the Madawaska River**—an illustrated talk by J. R. Montague. Hydraulic Engineer of the Hydro Electric Power Commission of Ontario. (25)

Mar. 16—Presidential Visit of Lt.-Col. L. F. Grant. (50)

Apr. 20—**Fluid Drives in Industry**—by R. R. Noyes, Canadian Sirocco Company. (30)

Sept. 26—Tour of proposed St. Lawrence Seaway and Power Project with President J. N. Finlayson.

Sept. 27—Presidential Dinner. (84)

Oct. 19—**Modern Water Treatment**—by Prof. J. D. Lee, Associate Professor of Civil Engineering, Queen's University. (30)

Nov. 22—**How Cotton is Made**—a tour of the Canada Mill of the Canadian Cottons Limited showing Spinning and Weaving. (50)

Dec. 13—Annual Meeting. A Dinner Meeting with reports from Committee Chairmen and installation of Officers. (37)

Edmonton Branch

The following report of activities is submitted by the Edmonton Executive for the year 1948. Attendance figures are shown in brackets.

Jan. 13—**Wood Preservation** by J. H. Palmason, Gen. Mgr., Prairie Division, Dominion Tar and Chemical Co. Ltd. (65)

Feb. 10—**The Joint Use of Poles by Electric Power and Communication Utilities** by D. G. Geiger, Transmission Engineer, Bell Telephone Co. of Canada Ltd. (61)

Mar. 3—**Why Manage the Resources** by Robson Black, President of the Canadian Forestry Association. (41)

Apr. 6—**Problems Encountered on the Alcan Highway** by Lt.-Col. J. R. B. Jones, D.S.O., O.B.E., Senior Engineering Officer, Western Command. Joint dinner meeting with Edmonton Branch of Military Engineers' Association of Canada. (85)

Apr. 16—**Foundation Conditions in the Edmonton Area** by Prof. R. M. Hardy, Dean of the Faculty of Engineering, University of Alberta. Evening meeting sponsored by Junior Engineers' Committee held at University of Alberta.

Apr. 23—Branch Annual Meeting—Highlights of the year's activities, election of officers, concluding with a smoker. (60)

May 1—Western Visit of President Grant—An informal dinner meeting, to which the ladies were invited, was held in The Jasper Room of the Macdonald Hotel on the occasion of President Grant's Western Visit. The President spoke of international affairs and presented the Institute prize to Mr. Arnold Lesk. (75)

Oct. 8—The introduction of a formal ball to Edmonton Branch activities. Attendance of 370 indicates that this will be carried on in the following years. (370)

Oct. 14—Western Visit of President Finlayson—The President was entertained at luncheon at the Mayfair Golf and Country Club by the Executive, and at dinner in the Macdonald Hotel by the Executive and members of the Edmonton Branch. The ladies were present at the dinner meeting. (50)

Nov. 23—**Second International Conference of Soil Mechanics and Foundation Engineering** by Prof. R. M. Hardy, Dean of the Faculty of Engineering, University of Alberta. (75)

Dec. 15—Tour of North-West Industries Plant. Arranged and conducted by Mr. B. W. Pitfield, General Manager. Members inspected the new RCAF Navigation Trainers and other plant activities. (75)

Halifax Branch

During the year nine monthly dinners have been held as follows:

Jan. —Annual Combined Banquet.

Feb. —Professor Vilbert Douglas; **Geological and Mineral Possibilities of the Coast of Labrador.**

Mar. —Hon. Harold Connelly; **Nova Scotia Industry.**

Apr. —Students Meeting—**What the Profession and Industry Expects of the Young Engineer.** Messrs. McNab, Doane, Chisholm - Theakston, Johnson, McClymont.

May —D. O. Robinson, **Developments in Cement and Concrete.**

Sept. —Presidential Visit—Dean J. N. Finlayson.

Oct. —Inspection Trip — H.M.C.S. Magnificant.

Nov. —Students' Meeting — C. M. Anson.

Dec. —Annual Business Meeting.

Hamilton Branch

During the past year, the Hamilton Branch held the following meetings. Attendance figures are shown in brackets.

Jan. 23—Annual Meeting at McMaster Univ. Refectory. The guest speaker, O. H. Somers of the Standard Gage Co. Inc., chose as his subject **Tools for Dimensional Quality Control.** (115)

Feb. 19—**Backstage in Automotive Engineering** by H. E. Churchill of the Studebaker Corporation. (125)

Mar. 18—The Annual Students' and Juniors' Papers Night. The following papers were presented:
Vertical Transportation — A Key to Radial Expansion Applied to Hamilton by G. L. Schenider, S.E.I.C.
The Control of Motorized Bi-Parting Doors for Freight Elevators by E. M. Tuff, JR.E.I.C.
The Control of Electric Power Load in Paper Mills by R. W. Kennedy, JR.E.I.C. (45)

Apr. 22—**Ten Million K.V.A. Circuit Breaker Tests and Cooling** by A. W. Hill, Westinghouse Electric Corporation. (175)

Sept. 16—The President's Visit. Dean J. N. Finlayson spoke, and presented prizes won by Branch members in the past year. (62)

Sept. 23—**Stainless Clad Plate and Sheet** by L. C. Grimshaw of the Jessop Steel Company. (78)

Oct. 21—**Public Transportation in the City of Hamilton** by P. A. S. Todd, of the Hamilton Street Railway Company. (51)

Nov. 18—Annual Ladies Night and Dinner at McMaster University. R. B. Hassall, of Smith and Stone, Georgetown, spoke on **Ceramics** and two colour films were shown. (106)

Dec. 9—**Functions of a Research and Development Laboratory in an Industrial Plant,** an address by A. A. Moline, M.E.I.C., Canadian Westinghouse Co. Ltd., and an inspection tour of the Westinghouse Laboratories. (170)

Kingston Branch

During the calendar year 1948 the branch held eleven meetings as outlined below:—

Jan. 27—**Present Day Method of Designing & Constructing Bridges Are Obsolete and Should Be Replaced by New and Modern Methods** by C. P. Disney, Intrusion Prepakt Co., Toronto—an illustrated lecture.

Feb. 24—Student Papers Night — A combined meeting with the Engineering Society of Queen's University. The Society had Air Vice-Marshall E. W. Stedman give an illustrated lecture on the **Bikini Experiment.**

Mar. 15—President's visit—A mixed dinner meeting to welcome Colonel L. F. Grant.

Apr. 19—**Some Recent Developments in the Uses of Aluminum** — an illustrated talk by G. R. Black of the Aluminum Company of Canada.

May 18—**A Maintenance Forum** — A varied discussion on the problems of mechanical, electrical and buildings and grounds maintenance with the respective speakers being R. N. Boyd, Nylon Division, Canadian Industries Ltd.; A. MacDonald, Aluminum Company of Canada; and Major F. Mutter, Area Engineer Officer, Eastern Ontario Area.

June 24—Annual meeting of the Kingston Branch—A mixed dinner meeting featuring the installation of the new officers for the 1948-49 term. A coloured film **The Great Lakes** was shown and Bruce Fisher demonstrated mystic tricks.

Sept. 28—President's Annual Visit — A mixed dinner meeting to welcome President J. N. Finlayson.

Oct. 21—**The Engineering Profession in Ontario** by G. L. Macpherson, M.E.I.C., President of the Association of Professional Engineers of Ontario—This was a joint meeting with the Association members in the Kingston District.

Nov. 9—**The Alaska Highway** — by Brigadier Geoffrey Walsh, M.E.I.C., Area Commander, Eastern Ontario Area. **Men Against Rock**—a film in sound and colour featuring heavy rock excavation. Courtesy of Mr. C. D. Rees, Gardner Denver (Canada) Ltd.

Nov. 29—**Clad Steels**—An illustrated talk by L. C. Grimshaw, of the Jessop Steel Company.

Dec. 14—**An Estimating Forum**—A discussion on Estimating, featuring talks by M. G. Saunders, M.E.I.C., Aluminum Company of Canada, Kingston on **Cost Estimating by the Engineer,** and G. L. Schuett, M.E.I.C., Schuett Construction Company on **Cost Estimating in Construction — the Contractor's Technique Review.**

Kootenay Branch

The following report of activities is submitted by the Executive of the Kootenay Branch for the year 1948. Attendance is shown in brackets for each meeting.

The Executive held six meetings during 1948. General meetings were as follows:

Feb. 27—Annual meeting and election of officers was held and a film entitled **The Life of Colonel Crompton** shown. (24)

Mar. 10—Guest speaker at a luncheon meeting was E. W. Henderson, Motor Engineer, English Electric Co. who spoke on **Factors Affecting Motor Design.** (31)

Apr. 21—Clair White, Mines Dept., of the Consolidated Mining and

Smelting Co. gave a very interesting address on **Bulk Petrol Supply for the Allied Armies in Europe.** (36)

May 6—A banquet in honour of Lt.-Col. L. F. Grant, President of the Engineering Institute and his party was enjoyed by some 100 guests. Highlight of this meeting was the posthumous presentation of the Sir John Kennedy Medal awarded by Mr. L. A. Campbell, Sr., to Mr. L. A. Campbell, Jr.

May 7—A dinner meeting was held in honour of Lt.-Col. L. F. Grant and Dr. L. Austin Wright. (25)

Oct. 1—A general business meeting was held featuring reports of delegates to the Annual Meeting at Banff. (24)

Nov. 12—A general business meeting was held. Discussions centering on the local school building by-laws were featured. (24)

Dec. 10—Dr. Neil Campbell, Geologist, Consolidated Mining and Smelting Co. addressed a luncheon meeting on the topic **Yellowknife.** (34)

Lethbridge Branch

The following meetings were held by the Lethbridge Branch during the year 1948. Attendance figures are shown in brackets. The executive held seven meetings with an average attendance of six.

Jan. 23—Joint meeting — E.I.C. and A.P.E.A. A. J. Cullen — **The Conodion Citizenship Act.** (58)

Feb. 21—Musical programme, films — **Spot News, Sight Seeing at Home, Play Town.** (28)

Apr. 24—Frank Taylor—**The Production ond Monufocture of Beet Sugor in Southern Alberta.** (24)

May 3—Special meeting—Visit of President L. F. Grant, and General Secretary, Dr. L. Austin Wright. (40)

Oct. 23—Joint Meeting — E.I.C. and A.P.E.A. H. B. Corey—**Development of Petroleum Industry in Province of Alberta.** (65)

Nov. 20—Ladies Night. H. E. Salisbury, General Manager Alberta Canning Co. — **Vegetable Canning and Marketing in Alberta.** (47)

Dec. 18—Musical Programme — Films. (40)

Lakehead Branch

The following meetings were held by the Lakehead Branch during the year (attendance shown in brackets).

Jan. 21—A dinner meeting held at the Village Inn at Intercity. The programme consisted of a film on **Atomic Research,** and **Eskimo Summer,** a colour film on the Eastern Arctic. (23).

Feb. 18—The Annual Ladies Night was held at the Port Arthur Country Club. The programme began with refreshments and a buffet supper. Two films — **A Tour Through the Kentucky Coverns** and **Loke Superior** were shown. The films were followed by dancing. (57 couples)

Mar. 18—The members were guests at a welding school conducted by the International Nickel Company under the auspices of the Midwest Branch of the Canadian Pulp and Paper Association. After a buffet supper representatives of the International Nickel Company presented several lectures illustrated by films. (30)

Apr. 21—A dinner meeting was held at the Marriaggi Hotel, Port Arthur, on the occasion of President Grant's visit to the Lakehead. (48)

May 21—A joint meeting with the Thunder Bay Branch of the Canadian Institute of Mining and Metallurgy was held at the Lakehead Technical Institute, Port Arthur. The speaker was Mr. B. Sutherland who gave an illustrated lecture on **Soil Mechonics.** (40)

June 15—The Annual General Meeting was held at the Port Arthur Country Club with the Branch Chairman Mr. S. E. Flook in the chair. J. M. Fleming reported on the Annual General Meeting of the Institute at Banff and the meeting was concluded with two films **Visuol Aids** and **Land of Pioneers.** (42)

Oct. 10—The branch joined with members of the Canadian Pulp and Paper Association for a motor trip to Aguasabon and Terrace Bay to inspect the New Hydro-Electric Plant of the Ontario Hydro Commission, the townsite of Terrace Bay, and the Pulp Mill of the Long Lac Pulp and Paper Company. Those present were guests of the Long Lac Pulp and Paper Company at dinner. (75)

Nov. 16—A general dinner meeting was held at the Royal Edward Hotel, Fort William. Mr. S. E. Flook, Branch Chairman, presided. Mr. Brown of the Lakehead Technical Institute gave a talk on the activities of that institution. Three technical films **Instolling Armoured Coble, Hydroulics** and **The Allis Cholmers Hydroulic Log Barker** were shown. (35)

Dec. 6—A dinner was held in the Orpheum Grill dining room, Port Arthur. Members of the staff and students in Applied Science of the Lakehead Technical Institute were guests. A round table discussion on student guidance was held and two films, **The Tennessee Volley Authority** and **Life on the Western Marshes** were shown. (48)

London Branch

The Executive of the London Branch is pleased to report seven Regular and Special Meetings as follows:

Jan. 22—Annual Meeting. Reading of Reports and Installation of New Officers. Guest speaker, Dr. G. B. Langford, President of the Association of Professional Engineers of Ontario who spoke on **The Engineer in Modern Society.**

Feb. 24—E. V. Buchanan, M.E.I.C., General Manager, London Public Utilities Commission and J. A. Vance, M.E.I.C., Vance Construction Company, Woodstock spoke on **The Engineers' Council for Professional Development.**

Mar. 25—W. K. Clawson, M.E.I.C., on **Problems of o County Engineer** and W. R. Smith, M.E.I.C., on **Conservation ond Flood Control.**

Apr. 27—Eric W. Leaver of Electronic Associates Limited, Toronto, on **Machines Without Men.**

Sept. 17—President's Visit. Dinner meeting with Dr. and Mrs. J. N. Finlayson as Guests of Honour.

Oct. 26—Brigadier H. A. Sparling, C.B.E., D.S.O., Commander, Western Ontario Area, on **The Engineer ond the Defence of Conada** followed by films **Fido** and **Pluto.**

Nov. 12—**The Engineering Profession.** A public meeting sponsored by the London Council for Adult Education at which E. R. Jarmain, M.E.I.C., Branch Chairman, presided over a panel of experts who explained our profession in a most unusual, interesting and entertaining manner.

The Branch Executive met seven times during the year.

Moncton Branch

Four meetings of the Executive were held during the year. There were five branch meetings held at which technical subjects were discussed and business transacted as follows:

Apr. 7—A meeting was held in the City Hall. F. Kerr gave an illustrated address on **Bridge Testing on the British Roilwoys.**

June 22—A meeting was held for the purpose of nominating branch officers for the year 1948-49.

June 29—The annual meeting was held on this date.

Aug. 30—A dinner meeting was held at the Shediac Yacht Club. J. N. Finlayson, President of the Engineering Institute of Canada, was the guest speaker.

Nov. 22—A meeting was held in the Reid Photographic Centre. Addresses were given by R. L. Parsons, G. L. Dickson and J. A. Godfrey on **Vorious Aspects of Town Planning as Affecting the City of Moncton.**

Niagara Peninsula Branch

The Branch Executive held nine executive meetings and one electoral meeting during the year. The following general meetings were arranged and conducted by the Programme Committee.

Jan. 22—The annual Ladies' Night was held at the Red Casque Inn. S. T. Hadley, Control Chemist of the Robin Hood Milling, assisted by Mrs. L. Ballantyne of the same company, spoke on **The Processing of Flour ond Use of It in the Home.** A buffet luncheon was served after the meeting.

eb. 19—A dinner meeting was held at the Welland House, St. Catharines. D. P. Douglass, Electrical Inspector for the Province of Ontario, spoke on **The Use of Electricity in Mines.** In addition, arrangements were made for the showing of a coloured film on **Prospecting in the North.**

Iar. 19—A joint meeting with the Professional Engineers of Ontario was held at the Red Casque Inn. Col. T. M. Medland, Executive Director of Professional Engineers Association, was the speaker.

.pr. 22—A dinner meeting was held at the Welland House, St. Catharines. A. D. Smith of the Foster Wheeler Company gave an interesting discourse entitled **An Engineer's Visit to Turkey.**

Iay 27—At the Red Casque Inn a joint meeting was held with the American Society for Testing Materials. R. B. Gordon, Manager, Metallurgical Development Section of Westinghouse Electric, Pittsburgh, spoke on the subject of **High Temperature Steels, Super Alloys and Ceramics.**

une 3—Electoral Meeting at the Red Casque Inn.

une 11—Annual Meeting held at the Red Casque Inn. J. W. Corbett, Manager of Industrial Relations for Hayes Steel Co. spoke on the timely subject of **Labour Relations.**

Sept. 20—A dinner meeting was held at the Red Casque Inn, with President J. N. Finlayson, the General Secretary Dr. L. A. Wright, and Mr. Vance, Vice-President, in attendance.

Oct. 21—A plant visit was made to the Ontario Paper Co., Thorold, after which dinner was served on the premises and a speaker explained the difficulties of processing newsprint.

Nov. 18—A dinner meeting was held at the Horton Steel Works, Fort Erie, the speaker was Mr. H. C. Boardman, Director of Research for the Chicago Bridge & Iron Co., Chicago. His topic was **Multispheres and Serrated Tanks.**

Montreal Branch

The following papers were presented in 1948 (attendance in brackets:—

Jan. 8—**Economical Design of Rural Power Systems,** by R. F. Quinn (Joint Meeting with A.I.E.E.). (130)

Jan. 15—**Sperry Detector Cars and Testing Rail in Track,** by J. W. Dickerson. (100)

Jan. 22—**The Weather in War and Peace,** by G. H. T. Kimble. (80)

Jan. 29—**Wage Incentives,** by J. Keith Louden. (140)

Feb. 5—Annual Meeting. (80)

Feb. 13—Dance. (550)

Feb. 26—Students' Night. (125)

Mar. 4—**84" diam. Prestressed Concrete Pressure Pipe,** by R. M. Doull, M.E.I.C. (140)

Mar. 11—**Planning, Building and Operating Canada's International Shortwave Broadcasting Service,** by G. W. Olive, O.B.E., D. G. McKinstry, W. A. Nicols, R. D. Cahoon, J. E. Hayes (Joint meeting with I.R.E.) (160)

Mar. 18—**Design of Suspension Bridge With Respect to Dynamic Wind Action,** by Dr. O. H. Ammann. (155)

Apr. 1—**Automatic Control for Steam Boilers and Industrial Processes,** by P. S. Dickey. (150)

Apr. 8—**Steam Turbine Electric Locomotives for Main Line Service,** by Charles Kerr, Jr. (100)

May 1—Visit to new Boiler Plant, Dominion Bridge Company. (120)

May 11—Demonstration of Basic Control Principles, by R. N. Pond. (Joint Meeting with Cdn. Pulp & Paper Assc.) (240)

June 7—Exhibit of Chemical Institute of Canada.

June 15—I.R.E. Annual Meeting at St. Hubert — Aircraft and Radar Display. Address by Dr. O. M. Solandt.

Sept. 30—Opening Meeting. (165)

Oct. 7—Exhibition of the Work of the Swiss Engineer Robert Maillart. (160)

Oct. 14—**Laboratory Investigation of the Mechanism of Cavitation,** by Dr. R. T. Knapp. (120)

Oct. 16—Visit to Canadian Tube and Steel Company. (150)

Oct. 21—**AC-DC Conversion & Inversion,** by Lysle W. Morton (Joint Meeting with A.I.E.E.). (110)

Oct. 28—**The Industrial Engineer, his Function and Place in Industry,** by H. M. S. Ferguson. (155)

Nov. 4—**Architecture in a Period of Transition,** by Hugh Ferriss, M.Arch. (Joint Meeting with the P.Q.A.A.). (225)

Nov. 11—**Television,** by Dr. George H. Brown, Ph.D. (Joint meeting with the I.R.E.). (160)

Nov. 18—Moving Pictures. (65)

Nov. 25—**Planning Rapid Transit for Toronto,** by W. H. Paterson, M.E.I.C. (175)

Nov. 27—Visit to Imperial Oil Refinery. (225)

Dec. 2—**Thermoplastic Covering for Electric Wires and Cables,** by C. R. Ostrom and W. J. Pardy. (160)

Dec. 9—**Dust Precipitators — Types, Applications and Limitations,** by G. T. Doyle. (160)

Dec. 16—**The Achievement of Utopias,** by Lewis Mumford. (Courtesy of McGill University).

Junior Section

The Junior Section maintained the policy worked out two years ago to promote meetings of a high educational though non-technical nature. The results indicate that this policy seems to be the best so far adopted. The attendance varied throughout the meetings from 40 to 200.

Seven Executive meetings were held during the year.

Public Speaking Classes drew an average attendance of 30 members. Meetings are held once a week at Ecole Polytechnique with George Morrison in charge.

The 4th Annual Dance with an attendance of over 650 people was organized by John L. Bateman.

The following meetings were held during the year:

Jan. 12—**Engineering Forest Products**—F. A. Harrison.

Jan. 26—Annual Meeting — Elections — Films — Refreshments.

Feb. 9—**Selling Yourself and Your Product**—B. Hoffman.

Feb. 23—**The Rights of the Workers**—J. Perreault.

Mar. 3—Ladies' Film Night.

Mar. 22—**Labrador Mining Explorations**—Dr. J. A. Retty.

Oct. 4—**Effective Speaking**—K. Swinton.

Oct. 18—**Magic of Heating Controls**—W. J. Robinson.

Oct. 29—Oyster Party.

Nov. 1—Ladies' Film Night.

Nov. 15—Students' Night.

Nov. 29—**In Mexico, it's the Custom, Senor**—Leo Scharry.

Dec. 3—4th Annual Dance.

Dec. 13—**Services of a Bank** — J. L. Davignon.

Ottawa Branch

The report of the proceedings committee indicates that twelve meetings were held in 1948 with an average attendance of E.I.C. Members of 105; the highest attendance being 136, the lowest 62. The subjects covered territory from the Clyde River in Scotland to the Arctic and the Canadian Rockies, and ranged from the Humanities through to Housing.

The most successful Luncheon Meeting was that addressed by the President of the Institute, and our attendance was increased by the presence of many members of the Engineers Wives Association. It has since been suggested that a "Ladies Day" Luncheon, should be considered as an annual affair.

The attendance record indicates that Luncheon Meetings are more popular than evening meetings, and that subjects of general interest are more acceptable than those of a strictly technical nature.

The Institute Meetings seem to have a broad unifying influence, as compared to the limited appeal of the technical Societies.

Feb. 5—Luncheon meeting at the Chateau Laurier. **The Engineer and the Humanities** by Dr. R. C. Wallace, Principal, Queen's University. (133)

Feb. 19—Luncheon meeting at the Chateau Laurier. **Search Unending,** an address and film dealing with Oil Discovery, by John Ness, Imperial Oil Limited. (104)

Feb. 24—Joint meeting with A.I.E.E. at the National Research Council Auditorium. **Influence of Metals on Electrical Apparatus** by F. R. Benedict, Manager, Industrial Engineering Department, Westinghouse Electric Corporation.

Mar. 4—Luncheon meeting at the Chateau Laurier. **Practical Research** by C. S. Parsons, Chief, Bureau of Mines, Ottawa. (131)

Mar. 18—Luncheon meeting at the Chateau Laurier. **Scientific Development of the North American Arctic** by W/C K. C. Maclure, Director, Arctic Research, Defence Research Board. (136)

Apr. 1—Luncheon meeting at the Chateau Laurier. Sound film, **Beaverships.** (104)

Apr. 5—Joint meeting with A.I.E.E. at the National Research Council Auditorium. **The Development of Atomic Power** by Bruce E. Prentice, General Electrical Co., Schenectady, N.Y.

Apr. 15—Luncheon meeting at the Chateau Laurier. **What Hope Is There for Housing** by J. L. E. Price, J. L. E. Price & Co. Ltd. (112)

Apr. 28—Auditorium, National Museum. **Some Soil Mechanics Problems and Projects in the United States and Mexico** by F. Lionel Peckover, Division of Building Research, National Research Council.

May 6—Luncheon meeting at the Chateau Laurier. **The Engineer and Community Planning** by S. A. Gitterman, Architectural Branch, Central Mortgage & Housing. (85)

Sept. 23—Luncheon meeting at the Chateau Laurier. The president of the Institute J. N. Finlayson, University of British Columbia. (200 including ladies)

Oct. 14—Luncheon meeting at the Chateau Laurier. **P.F.R.A.** by G. L. MacKenzie, Chief Engineer, Prairie Farm Rehabilitation Branch, Dept. of Agriculture. (62)

Oct. 18—Joint meeting with the Division of bldg. research at the National Research Council, Main Building, Ottawa, Ont. **Doring Use of Reinforced Concrete by Robt. Maillart** by Robert Schreiver.

Oct. 28—Luncheon meeting at the Chateau Laurier. **Engineering for Safe Highways** by J. D. Millar, Deputy Minister, Dept. of Highways, Ontario. (75)

Nov. 18—Joint luncheon meeting with C.I.M. & M. at the Chateau Laurier. **A Glimpse of Britain** by G. C. Monture. (153)

Dec. 2—Luncheon meeting at the Chateau Laurier. **The Snare River Hydro Electric Development** by Norman Marr, Acting Controller, Dominion Water & Power Bureau. (96)

Peterborough Branch

Nine Executive meetings were held with an average attendance of eight. The following summarizes the eight Branch meetings during the year with attendance figures in brackets. Average attendance 42.

Feb. 19—**Micro Waves** by A. A. Blanchford, Bell Telephone Co. of Canada Ltd. (54)

Mar. 18—**Weather Forecasting** by W. G. Green, Department of Transport. (38)

Apr. 15—**Tools for Dimensional Control** by O. H. Somers, Standard Gauge Co. (71)

May 20—**Recent Developments in Aluminum** by W. S. Dunford, Aluminum Co. of Canada. (31)

Sept. 24—**Annual Dinner** addressed by E.I.C. President Dean J. N. Finlayson, University of B.C. (54)

Oct. 16—**Fall Outing**—Trip to Trenton Air Station as guests of W/C E. C. Luke. (16)

Oct. 28—**Soil Conservation Symposium** by D. R. McGregor, N. W. Finnie, and C. W. Holman, Peterborough Branch; and G. A. Hills, Ontario Dept. of Lands & Forests. (31)

Nov. 25—**China Today** by J. K. Sexton, Montreal Engineering Co. (38)

Québec Branch

The Executive Committee held six meetings with an average attendance of nine members for the transaction of branch business.

The activities of the Branch were varied and well attended, the programme of activities being as follows (attendance given in brackets):

Feb. 9—**Construction of an 84 inch diameter prestressed concrete pipe for the city of Montreal,** by R. M. Doull, General Manager, the Canada Gunite Co. Ltd., Montreal. (30)

Feb. 18—**Nouveaux usages pour l'aluminum et ses alliages,** by Claude P. Beaubien, Manager, Aluminum Co. of Canada, Quebec. (50)

Mar. 18—**Transite Pipe,** paper and and films, by W. D. Barron and S. M. Wilson, Canadian Johns Manville Co. Ltd. (32)

Mar. 30—Students' night. (42)

Apr. 12—**Conditionnement de l'air pendant l'hiver,** by Dr. P. A. Bricout, professor, Faculty of Science, Laval University. (45)

Apr. 26—**Etude de la Centrale actuelle de Beauharnois,** by Rene Dupuis, director-manager and chief engineer, Beauharnois Light Heat and Power Co. (48)

Apr. 30—Ritual of the calling of an engineer. (55)

May 31—**The Control of Atomic Energy,** by General A. G. L. MacNaughton, Canadian Delegate to the United Nations Organization. The branch was invited by the Quebec Military Institute to participate in this meeting. (75)

June 28—Annual General Meeting of the Branch. (22)

Sept. 13—The President's visit and the Annual Golf Tournament of the Branch. (104)

Oct. 18—**Fiberglass,** paper and films, by Kent Hutchison. (41)

Nov. 17—Visit to the new automatic Bell Telephone Exchange on St-Cyrille Street. (50)

Dec. 20—**D'ou viennent vos kilowatheures,** by Lionel Swift, Superintendent, Power Division, Quebec Power Company Ltd. (50).

Saguenay Branch

During the year the Branch held a total of six general meetings:—

Jan. 29—**Pulpwood Operation—from the Forest to the Mills** by J. L. Kelly, Manager, South Kenogami Division, Price Brothers Co., Chicoutimi, P.Q.

Feb. 19—**Recent Developments in the Uses of Aluminum** by G. K. Black, Sales Division, Aluminum Company of Canada, Montreal, P.Q.

Apr. 1—**Research and Industrial Progress** by G. E. Bourne, Manager, Special Products section, Apparatus Division, Canadian General Electric, Toronto.

May 27—**Scandinavia As Seen by a Canadian Hydro Electric Engineer** by F. L. Lawton, Aluminum Company of Canada, Montreal.

Aug. 27—Dinner Meeting and Visit of President, Dean Finlayson and Party.

Sept. 8—**Some World Problems** by Dr. R. C. Wallace, Principal, Queen's University, Kingston.

Junior Section

The Junior Section held a series of five meetings as follows:—

Feb. 4—**Fabricating Aluminum at Arvida** by F. E. Hogg, Aluminum Company of Canada.

Mar. 18—**Development and Processing of Aluminum Alloys** by K. M. MacQuarrie, Aluminum Company of Canada.

Apr. 21—**The Course of Copper and Gold** by W. A. Dayton, Aluminum Company of Canada.

June 5—**Informal Talk on a Recent Trip to Europe** by F. G. Barker, Aluminum Company of Canada.

Dec. 6—Annual meeting and film night.

Saint John Branch

On behalf of the Executive of the Saint John Branch we have the honour of presenting the annual report of the Branch for the year ending December 31st, 1948.

Four special meetings of the Branch were held during the year, all of them at the Admiral Beatty Hotel in Saint John (attendance shown in brackets):

Jan. 29—Annual Joint Dinner Meeting with the N.B. Association of Professional Engineers. Speaker: D. O. Robinson, **Concrete and Air Entrainment.** (70)

Mar. 24—Dinner Meeting with the presentation of Canadian General-Electric Company's films: (1) **Clean Waters,** (2) **Story of Frequency Modulation.** (48)

Apr. 22—Dinner Meeting: Mr. G. Lorne Wiggs presented a paper entitled **Radiant Heating and Cooling.** (58)

Oct. 21—Dinner Meeting: Approximately 80 students from University of New Brunswick accepted our invitation to hear Colonel Robert J. Cassidy deliver his paper entitled **Engineer Preparations for D-Day Landing in Normandy.** (125)

In addition to the Branch Meetings the Saint John Branch, in co-operation with the other Maritime Branches of the Institute, namely, Moncton, Halifax, and Sydney, and the Professional Associations of New Brunswick and Nova Scotia, arranged for and carried out the Maritime Professional Meeting at the Algonquin Hotel at St. Andrews-by-the-Sea on September 8th, 9th and 10th. There were over 200 members and their wives registered at the meeting. This provided the members of the Saint John Branch with an opportunity of meeting the President and his party, as no special Branch meeting was called for this purpose in Saint John. President Finlayson, accompanied by Mrs. Finlayson, attended the St. Andrews meeting, and many of our members became well acquainted with him while there.

The annual meeting of the Branch was held as a Dinner Meeting on December 16th and a new slate of officers for the year 1949 was duly elected. The annual report of the Executive was presented to the Branch as well as the annual membership and financial statements for the year. There were 33 members present.

There were five Executive Meetings during 1948, with an average attendance of eight members.

St. Maurice Valley Branch

The St. Maurice Valley Branch had a successful year during which there were seven branch meetings and five executive meetings. The branch by-laws were completely revised and Junior Sections were formed in Shawinigan Falls and Three Rivers.

The following is a list of the branch meetings:—

Feb. 3—Lecture meeting at Cascade Inn, Shawinigan Falls. **New Power Development at Shawinigan Falls** by E. V. Leipoldt, M.E.I.C., Vice President, Shawinigan Engineering Co. Illustrated with lantern slides.

Feb. 17—Theatre Night at Cascade Inn, Shawinigan Falls. Various industrial films.

Apr. 16—Annual dinner meeting at Cascade Inn, Shawinigan Falls. Dr. J. T. Rettaliata, Illinois, Technical Institute, presented an illustrated talk on **Gas Turbines and Jet Propulsion.**

Sept. 14—Visit of President J. N. Finlayson. Dinner meeting at Cascade Inn, Shawinigan Falls.

Sept. 26—Joint luncheon meeting with A.I.E.E. at Hotel Windsor, La Tuque. Guy Rinfret, M.E.I.C., Shawinigan Engineering Co., spoke on **Power Development in the St. Maurice Valley.** Plant visits to the Power House and Brown Corporation Paper Mill and refreshments at the Golf Club completed the day.

Oct. 21—Dinner meeting at St. Maurice Hotel, Three Rivers. Paul G. A. Brault, of Dominion Bridge Co., spoke on the **Design and Construction of the Duplessis Bridge,** illustrated with lantern slides.

Dec. 9—Film Night at Cascade Inn, Shawinigan Falls. Various illustrated films.

Shawinigan Falls Junior Section

Jan. 22—Lecture Meeting. **The Industrial Development of Shawinigan Falls** by J. S. Whyte, M.E.I.C., Shawinigan Chemicals Ltd.

Mar. 22—Short talks by young engineers.

Apr. 27—Lecture Meeting. **Labour Relations** by C. T. Cornelius, Aluminum Company of Canada.

June 10—Election Meeting.

June 29—Dinner Meeting. **Impressions of South Africa** by E. R. Williams, M.E.I.C., Shawinigan Chemicals Limited.

July 10—Plant visit to Shawinigan Water & Power Co. No. 3 Power House under construction.

July 24—Plant visit to Carbide Division of Shawinigan Chemicals Limited.

Aug. 7—Plant visit to Belgo Division of Consolidated Paper Corporation Ltd.

Aug. 19—Plant visit to Plant No. 1, Aluminum Co. of Canada.

Oct. 10—Lecture Meeting. **The Development of Carbide** by J. S. Whyte, M.E.I.C., Shawinigan Chemicals Ltd.

Nov. 30—Plant visit to Shawinigan Water & Power Co. No. 3 Power House under construction.

Dec. 1—Film Night, ladies invited.

Three Rivers Junior Section

Jan. 19—Plant Visit to Canada Iron Foundries Ltd.

Feb. 9—Discussion by R. Clark, of St. Maurice Valley Chronicle.

Feb. 23—Film Night.

Sarnia Branch

The Sarnia branch of The Engineering Institute of Canada during its third year held nine general meetings and twelve executive meetings. The following is a list of the general meetings:

Jan. 15—Dinner meeting held at the Polymer Cafeteria. Dr. Carl Whittemore of the Deloro Mining and Smelting Company, Madoc, Ontario, spoke on the subject of **Cobalt.**

Mar. 2—Combined dinner meeting held at the Lutheran Church at which the C.I.C. members were our guests. Mr. K. A. Henderson, Vice-President and Treasurer of the Imperial Oil Limited, spoke on the subject of **Canadian Finance in Relation to our National Position.**

Apr. 6—A smoker at the Vendome Hotel. W. R. Manock, President of the Ontario division of the E.I.C. spoke on the history and growth of the Ontario division. Two other topics **Town Planning** and **C.I.C. and E.I.C. Co-operation** were discussed at considerable length during the evening.

Apr. 30—A special meeting called to discuss bill No. 195 concerning the exclusion of engineers from collective bargaining.

May 26—Junior Night. This meeting took the form of a smoker held at the Golf Club. The early part of the evening was devoted to a tour through the Holmes Foundry and their new rock wool insulation plant. This was followed by refreshments and an informal discussion at the Golf Club.

Oct. 5—The President's visit and the annual Ladies Night. A dinner preceded by cocktails was held at the Golf Club. President Finlayson was accompanied by his wife and Mr. and Mrs. J. Vance. Mr. Vance is Vice-President of E.I.C. representing Ontario. President Finlayson and Mr. Vance addressed members and the ladies.

Oct. 28—E.I.C. were guests at the Ladies Night meeting at the Lutheran Church at which the Sarnia branch of the Chemical Institute were hosts. J. W. Bateman, of the Canadian General Electric Company gave a lecture on **The Magic of the Spectrum.**

Nov. 24—A dinner meeting held at the Fischer Hotel. R. F. Legget, Director of Building Research of the National Research Council spoke on **Building Research in Canada and Abroad.**

Dec. 9—Annual meeting.

Saskatchewan Branch

All meetings were held jointly with the Association of Professional Engineers. Average attendances at dinner and lecture meetings were 54 and 28 respectively. Programmes were as follows:

Jan. 16—Canadian Army re "Engineer in War" by Col. H. W. Love.

Feb. 20—Annual Meeting followed by dinner and Address by F. B. Bagshaw, K.C., entitled **Kipling and the India of Yesterday.**

Feb. 27—**Combined Use of Poles** by D. G. Geiger. (Lecture Meeting).

Mar. 19—**Expedition Muskox** by W. R. Young.

Apr. 27—Mixed Dinner addressed by Pres. L. F. Grant and Gen. Sec. L. Austin Wright. Summary of E.I.C. Affairs and Collective Bargaining were discussed.

Oct. 22—**Telephone Night** (followed by inspection of telephone equipment). Speaker, S. R. Muirhead.

Nov. 5—Lecture Meeting addressed by G. Bell, Chairman, British Consulting Engineers Association.

Nov. 19—Special Meeting to discuss **Collective Bargaining** in the light of recent Federal Legislation.

Dec. 17—**Sodium Sulphate Manufacture** (illustrated) by A. A. Holland.

Sault Ste. Marie Branch

The Sault Ste. Marie Branch of the Engineering Institute of Canada held five general meetings and three executive meetings during 1948. The general meetings were as follows:

Feb. 27—**The Development of the Paper Making Industry,** a paper presented by G. W. Holder of the Abitibi Power & Paper Co.

Sept. 24—A talk on **Meteorology** by Mr. Meyers of the U.S. Weather Bureau station at Soo, Michigan.

Branches	Border Cities	Calgary	Cape Breton	Cornwall	Edmonton	Halifax	Hamilton	Kingston	Kootenay	Lakehead	Lethbridge	London
MEMBERSHIP												
Resident												
Hon. Members	...	...	...	...	...	1	...	2	...	...	...	...
Members	65	142	35	22	118	192	116	52	23	41	21	47
Juniors	21	29	4	5	43	17	42	12	6	16	5	12
Students	24	21	13	4	90	105	49	72	5	15	3	29
Affiliates	...	2	1	2	2	2	1	...	...	7	...	2
Total	110	194	53	33	253	317	208	138	34	79	29	90
Non-Resident												
Hon. Members	...	...	...	...	...	1	...	...	...	...	...	...
Members	13	21	34	5	14	74	34	8	14	16	19	9
Juniors	4	5	13	2	6	6	36	1	5	11	4	4
Students	8	10	12	3	4	41	29	3	12	15	6	6
Affiliates	...	...	1	...	...	...	...	...	...	...	...	...
Total	25	36	60	10	24	122	99	12	31	42	29	19
Grand Total December 31st, 1948	135	230	113	43	277	439	307	150	65	121	58	109
" December 31st, 1947	118	192	90	44	221	346	255	119	42	108	46	106
Branch Affiliates, December 31st, 1947	...	45	...	20	...	...	12	1	...	...	6	2
FINANCIAL STATEMENT												
Balance as of December 31st, 1947	584.45	266.67	666.11	200.44	457.13	587.92	117.14	286.71	154.20	267.35	135.50	200.8
Income												
Rebates from Institute Headquarters	316.80	131.64	112.04	83.19	104.90	46.05	678.82	294.90	104.06	238.20	28.62	334.7
Payments by Professional Assns.	...	403.95	279.55	...	348.00	701.20	...	...	...	...	81.75	...
Branch Affiliate Dues	...	168.25	...	60.00	...	...	10.00	...	...	...	18.00	8.0
Interest	11.10	28.76	12.22	...	...	2.13	31.59	.97	...	3.00	...	3.0
Miscellaneous	401.75	200.00	76.50	244.95	51.30	214.23	27.00	...	235.75	576.25	12.30	336.0
Total Income	729.65	932.60	480.31	388.14	504.20	963.61	747.41	295.87	339.81	817.45	140.67	681.7
Disbursements												
Printing, Notices, Postage①	66.93	212.90	21.48	44.99	78.56	191.09	208.27	65.01	31.98	79.40	27.13	43.1
General Meeting Expense②	497.11	145.26	...	...	184.18	293.90	...	213.67	...	362.65	28.56	106.0
Special Meeting Expense③	...	238.62	152.60	420.91	131.69	167.30	309.59	...	340.50	273.00	43.32	461.6
Honorarium for Secretary	...	20.45	...	...	75.00	100.00	...	...	...	...	25.00	...
Stenographic Services	...	20.00	6.00	...	5.00	77.40	50.00	...	...	...	...	5.0
Travelling Expenses④	...	13.55	...	...	...	...	...	...	...	...	...	...
Subscriptions to other organizations	...	...	...	...	...	...	...	...	...	...	...	...
Subscriptions to *The Journal*	...	30.75	...	14.00	...	...	4.00	...	...	...	2.15	2.0
Special Expenses	12.76	97.80	...	...	...	81.00	...	60.50	...	...	26.25	9.0
Miscellaneous	.35	66.62	...	...	...	39.50	62.63	...	9.86	...	1.13	...
Total Disbursements	577.15	845.95	180.08	479.90	474.43	950.19	634.49	339.18	382.34	715.05	153.54	626.7
Surplus or *Deficit*	152.50	86.65	300.23	*91.76*	29.77	13.42	112.92	*43.31*	*42.53*	102.40	*12.87*	54.9
Balance as of December 31st, 1948	736.95	353.32	966.34	108.68	486.90	601.34	230.06	243.40	111.67	369.75	122.63	255.8

①Includes general printing, meeting notices, postage, telegraph, telephone and stationery.
②Includes rental of rooms, lanterns, operators, lantern slides and other expenses.
③Includes dinners, entertainments, social functions, and so forth. ④Includes speakers, councillors or branch officers.

f the Branches as at December 31, 1948

Moncton	Montreal	Niagara Peninsula	Ottawa	Peterborough	Quebec	Saguenay	Saint John	St. Maurice Valley	Sarnia	Saskatchewan	Sault Ste. Marie	Toronto	Vancouver	Victoria	Winnipeg
...	2	...	2	...	...	...	...	...	...	...	...	1	...	1	...
57	1,347	100	329	44	130	71	63	81	48	135	22	582	241	63	184
11	400	19	73	16	41	20	12	44	16	34	5	238	67	11	60
30	1,064	31	132	19	108	15	19	31	16	123	3	373	364	16	189
1	26	2	11	...	1	1	3	1	...	...	2	10	5	...	4
99	2,839	152	547	79	280	107	97	159	80	292	32	1,204	677	91	437
...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
22	105	4	45	27	19	10	61	4	2	54	59	33	54	19	16
12	36	1	22	19	7	5	19	...	1	11	34	13	21	4	14
23	48	2	16	11	11	...	131	1	1	...	23	24	39	13	19
...	1	...	...	2	1	1	...	...	...	...	...	3	3	...	...
57	190	7	83	59	38	16	211	5	4	65	116	73	118	36	49
156	3,029	159	630	138	318	123	308	164	84	357	148	1,277	795	127	486
128	2,640	146	585	104	245	112	249	150	74	250	123	1,158	518	100	404
3	11	2	19	14	...	...	18	...	...	...	5	...	...	1	10

*For voting purposes only, there should be added to Montreal Branch, an additional 440 members, 263 being resident in the United tates, 108 in British possessions and 69 in foreign countries.

Moncton	Montreal	Niagara Peninsula	Ottawa	Peterborough	Quebec	Saguenay	Saint John	St. Maurice Valley	Sarnia	Saskatchewan	Sault Ste. Marie	Toronto	Vancouver	Victoria	Winnipeg
329.16	3,733.39	307.28	943.21	187.25	537.23	383.45	331.89	253.80	238.05	120.30	386.18	938.25	522.97	154.69	1,163.92
129.76	4,886.25	387.60	1,058.45	275.40	515.80	290.40	148.45	392.80	219.00	34.29	298.80	1,855.00	732.52	223.64	730.50
116.00	...	...	...	...	...	...	190.00	...	...	571.71	...	...	...	...	...
15.00	75.00	...	84.00	22.00	...	...	82.00	...	...	...	15.00	...	...	3.00	50.00
4.67	30.00	13.47	64.65	1.01	...	...	...	.65	...	...	15.00	16.25	10.18	...	25.50
79.50	1,178.91	...	65.25	198.00	66.62	112.19	...	548.00	365.65	...	...	142.50	1.50	231.00	160.28
344.93	6,170.16	401.07	1,272.35	496.41	582.42	402.59	420.45	941.45	584.65	606.00	328.95	2,013.75	744.20	457.64	966.28
20.87	1,971.48	119.92	250.80	91.73	97.53	18.39	93.00	97.54	44.39	141.74	28.72	1,104.88	315.41	90.05	350.53
18.00	179.50	3.03	35.00	86.55	65.05	52.12	1.25	10.23	...	255.44	94.60	243.62	75.12	28.00	60.00
149.21	2,010.28	70.10	550.74	266.23	151.14	260.08	126.35	655.93	540.10	...	26.00	237.90	157.18	322.10	251.91
25.00	460.00	75.00	...	...	100.00	40.00	60.00	...	...	114.00	25.00	125.00	50.00	35.00	75.00
10.00	180.00	15.03	100.00	...	...	...	15.00	10.00	...	...	...	23.00	20.00	...	...
...	55.75	...	...	...	...	25.00	...	...	...	151.03	...	130.40	...	50.00	131.10
...	...	...	...	...	15.00	...	...	...	...	...	...	...	...	...	3.00
8.15	20.00	...	...	6.00	...	...	26.45	...	...	...	10.00	...	...	...	20.00
...	88.36	.90	220.15	...	100.00	...	...	50.00	...	...	...	5.00	...	...	30.00
7.53	102.50	...	85.65	18.73	115.58	...	3.50	1.32	...	15.20	.65	22.00	35.69	5.15	57.21
238.76	5,067.87	283.98	1,242.34	469.24	644.30	395.59	325.55	825.02	584.49	677.41	184.97	1,891.80	653.40	530.30	978.75
106.17	1,102.29	117.09	30.01	27.17	*61.88*	7.00	94.90	116.43	.16	*71.41*	143.98	121.95	90.80	*72.66*	*12.47*
435.33	4,835.68	424.37	973.22	214.40	475.35	390.45	426.79	370.23	238.21	48.89	530.16	1,060.20	613.77	82.03	1,151.45

Oct. 29—**Cathodic Protection as Applied to Pipe Lines and Steel Structures,** a paper presented by Mr. T. R. B. Watson, corrosion engineer, Dominion Magnesium Ltd.

Nov. 26—**The Wealth of a Nation** a colour film presented through the courtesy of Abitibi Power and Paper Co. Ltd. Also a talk on the Geiger counter by Professor Kemp of the Houghton School of Mines.

Dec. 17—Annual Meeting.

Toronto Branch

The Executive held fourteen meetings with an average attendance of ten.

Regular meetings of the Branch are listed below, with attendance given in brackets.

Jan. 24—Ladies' Night. (114)

Jan. 28—Students' Night. (Joint with Junior Section). **Atomic Engineering** by A. S. Halpenny. **Characteristics of Kodachrome Film** by T. L. Faul. **The Heat Pump** by Richardson. **The Employees' Attitude to Management** by MacKenzie. **Solar Energy** by Hill. (62)

Feb. 26—**Load Testing Applied to Airport Runway Design,** by Dr. Norman W. MacLeod. (95)

Apr. 27—Annual Meeting—**Talk Tracks That Turn,** by Mr. Geo. L. Long. (67)

May 17—Collective Bargaining for Engineers — General Discussion. (67)

Oct. 1—President's Visit. (90)

Oct. 15—Exhibit of Work of Robert Maillart.

Oct. 28—**Growth of Hydro Related to Economic Development of Ontario,** by Mr. R. L. Hearn, (215)

Nov. 25—**Developments in Building Research,** by Mr. R. F. Legget. (200)

Junior Section

During the past year and a half the Junior Section has been handicapped by the loss of its executive members to the Senior Section. Suggestions were even made that the Junior Section should be disbanded until a group of recent graduates rallied to the cause and undertook to guide the section through a year's activities. In October 1948 another new executive was appointed comprising some members of the previous executive and some new members. It is their object to advance the work of the section and set up machinery for proper elections so that the general membership may participate more fully in governing its activities.

Seven executive meetings and the following general meetings were held in the past year. (Attendance in brackets.)

Jan. 28—Students' Night. (62)

Mar. 18—Annual Meeting. **Pre-Stressed Concrete** by E. A. Hesketh. (125)

Nov. 11—**Some Aspects of Atomic Energy** by D. H. W. Kirkwood; **Communication in Field and Industry** by G. F. C. Weedon; and **Application of Law to Engineering** by F. R. Duncan. (100)

Dec. 13—**Symposium on High Speed Flight** by Russell Bannock and Dr. Joslyn Rogers Jr.

Vancouver Branch

Jan. 21—Speaker: Dr. Lyle G. Trorey, M.E.I.C., **Air Surveys and Mapping.**

Feb. 18—Students' Night. Student Chairman—Alan Fletcher. Speakers: John McPhail. **Three Methods of Road Surfacing;** Don Jamieson, **The Erection of the Pine River Bridge;** Robin Fjarlie, **An Oceonographic Model of Alberni Harbour.**

Mar. 17—Speaker: J. A. Walker, **Town Planning in Vancouver.**

Apr. 21—Speaker, J. B. Alexander, Forest Products Laboratory, University of B.C.; **Wood as an Engineering Material.**

May 13—President's Visit. Lieutenant-Colonel L. F. Grant, President; L. Austin Wright, General Secretary.

June 16—Speaker: Huet Massue, **A Statistical Analysis of the Tennessee Valley Authority.**

July 28—Visit—B.C. Research Council.

Aug. 18—Visit — B.C. Sugar Refining Company.

Sept. 15—Ladies' Night. Technicolour Film—**The Land of Flowers and Missions — (California).** Photographed and shown by Oscar Olson. Address: **The Electric Home of the Future**—Bruce Donaldson, Canadian General Electric. Technicolour Film—**Travels Through Mexico** — Photographed and shown by Oscar Olson.

Oct. 20—Speaker: Frank Kerry, **Tonnage Oyxgen.**

Nov. 20—Annual Meeting.

Dec. 15—Dinner Meeting, Past Chairmen.

Victoria Branch

During the year there were five meetings of the Executive and eight general meetings including the Annual Meeting of December 19, 1947 and the Presidential Dinner May 17, of this year. President Grant and the General Secretary Dr. Wright were luncheon guests of the Executive on May 17, when an informal discussion was carried on relative to Institute affairs, while at the same time the ladies were entertained by the wives of the executive. A list of the meetings with speakers and subjects follows:—

Dec. 19—Annual Meeting and dinner. Election of officers for 1948 and other related business, followed by address of Chas. T. Hamilton, his subject being **The Victoria Memorial Arena.**

Jan. 16—Address by H. C. Anderson, Chief Engineer, Department of Public Works, Province of British Columbia on the subject **Our Highway System.**

Feb. 13—Address by D. G. Geiger, Engineer of the Western Area of the Bell Telephone Company of Canada. Subject, **The Joint Use of Poles by Electric Power and Communication Utilities.**

Mar. 19—Address by J. R. Johnston. Assistant Forester of the British Columbia Forest Service. Subject **Fire Weather and Forecasting in British Columbia.**

Apr. 16—Address by Lt.-Col. G. S. Andrews, M.B.E., Air Surveys Engineer, Government of British Columbia. Subject **Wartime Air Survey Developments Applied to the Mapping of British Columbia.**

May 17—Branch reception and dinner in honour of Lt.-Col. L. F. Grant, President of the Institute, and Dr. L. Austin Wright, General Secretary. Mrs. Grant and Mrs. Wright attended the dinner and members wives were also in attendance. Col. Grant's address dealt with problems of great importance to the Engineering Profession in Canada.

June 1—A number of Engineers from this Branch attended the Annual Meeting of the Institute at Banff. S. H. Frame was elected to Council.

Oct. 22—Address by Dr. F. W. Gray, late Assistant General Manager of Dominion Steel and Coal Corporation. Subject **Mining Coal Under Sea** with special reference to the mines in Cape Breton, Nova Scotia.

Nov. 19—Address by H. D. Dawson, Municipal Engineer, Municipality of Saanich, Vancouver Island, on **Problems and Experiences in Municipal Engineering, Including Preliminary Studies in the Gorge Canal Project.** At this meeting the officers of the Branch for 1949 were nominated.

Meetings were well attended and with the increase of twenty-seven members during the year, there should be added interest in Branch Affairs.

Winnipeg Branch

During the year 1948 the executive of the Branch held 10 meetings, the average attendance being 11.

The following general meetings of the Branch were held. with the attendance figures shown in brackets:—

Jan. 8—Annual meeting of the Branch —addressed by T. N. Miller, Superintendent of Pole Preservation, Manitoba Power Commission, on the subject of **Wood Preservation.** (54)

Feb. 19—**Design & Construction of a Hydro Electric Development** by R. E. Heartz, Vice-president and Chief Engineer. Shawinigan Engineering Co. (107)

Mar. 18—**Sanitary Engineering Developments in Canada** by Dr. A. E Berry, Director, Sanitary Engineering Division. Ontario Department of Health. (73)

Apr. 8—**Some Problems in the Development and Administration of**

Noturol Resources by D. M. Stephens, Deputy Minister of Mines & Natural Resources, Province of Manitoba. (53)

Apr. 26—Luncheon meeting with President L. F. Grant. (72)

Sept. 23—**A Stotistical Anolysis of the Tennessee Volley Authority** by Dr. Huet Massue, Statistical Engineer, Shawinigan Water & Power Co. (80)

Nov. 19—Joint meeting with I.R.E.—**Modern Electronic Educotion** by E. L. Palin, Director of Electronic Education, Ryerson Institute of Technology, Toronto. (79)

Dec. 10.—Joint meeting with the Engineers' Wives Association; Dr. A. H. S. Gillson, President of the University of Manitoba, addressed the gathering. (130)

Dec. 16—**New Applicotion of FM & Television** by W. H. Holroyd, Electronics Division, Canadian General Electric Co. A film **Jet Propulsion** was also shown. (85)

Student Section

Oct. 25—**Aims & Activities of the E.I.C.** by T. E. Storey, Chief Engineer, City of Winnipeg Hydro Electric System. (57)

Nov. 22—**Noturol Resources of the Proirie Provinces** by D. M. Stephens, Deputy Minister of Mines & Natural Resources, Manitoba. (54)

Electrical Section

During the year 1948 the Electrical Section held eight General Meetings as follows.

Jan. 16—Mr. Paul M. Ross, Superintendent of the High-Voltage Laboratory of the Ohio Brass Co. at Barberton, Ohio, gave a paper on **Burning of Wood Structures by Leokage Currents** (illustrated). (72)

Jan. 30—Mr. G. A. Muir, Special Service Engineer of the Manitoba Telephone System, spoke on **Mobile Telephone Service** (demonstration). (250)

Feb. 12—Annual Meeting of the Section. Following reports by Mr. D. A. McCuaig retiring chairman and Mr. L. A. Bateman, Secretary, Mr. M. D. Young the incoming chairman took the chair. Speaker for the evening was Mr. M. B. Mallett, chief engineer of the English Electric Co., who spoke on **Progress in Transformer Design.** (51)

Mar. 4—Mr. W. D. Garbutt, Technical Sales Manager of the Hackbridge and Hewittic Electric Co. of Canada, gave a paper on **Sixty Yeors of Rectifier Development** (illustrated). (73)

Mar. 12—Annual Dinner and Dance at the Marlborough Hotel, Winnipeg. Mr. H. Moody of Moody & Moore, architects, spoke on **Modern Moteriols in Construction.** (133)

Apr. 15—Mr. H. R. Sills, Senior Assistant Engineer of the Motor and Generator Division, Canadian General Electric Co., gave a paper on **Turbine Driven Generators.** (46)

Oct. 7—Mr. R. Noonan, General Manager of the Pioneer Electric Co., spoke on **Tronsformer Manufocture** (Plant Visit). (96)

Dec. 2—Mr. R. H. Andrews of the Canada Wire and Cable Co., gave a paper on **High Voltoge Coble-Development and Conodion Instollotions** (illustrated). (48)

Samuel Fortier—Pioneer in Soil Mechanics

(*Continued from page 68*)

does not bear the stamp of his counsel. He may well be said to be one of the group of engineers and scientists which enabled the West to take the place which it now occupies in relation to the agricultural economy of the United States.

Important as were his contributions to irrigation, Dr. Fortier's early studies in the field now called Soil Mechanics make him an important figure in the annals of North American engineering. His early paper to the Canadian Society of Civil Engineers contained the principal record of the clear and incisive thinking which he devoted to the engineering properties of soils, long before their importance had been generally recognized.

This paper, entitled " The Storage of Water in Earthen Reservoirs ", contains a useful discussion of soil sampling. The mechanical analysis of soils is naturally stressed, and though Dr. Fortier was limited to the practice of sieving, he suggests analysis of the finer particles might be done by means of mechanical soil separators like those invented by Drs. Hilgard and Osborne. He saw the importance of the void ratio in soils, and made ingenious attempts to determine this by dropping soil from a standard height into water.

Perhaps the most surprising feature of Dr. Fortier's work was his clear appreciation of the importance of compaction in the use of soils for the construction of earth dams. He uses the term " clay concrete " in discussing the construction of earth dams. The following statement shows clearly his logical approach to this important branch of soil work; " Since there are serious objections to each class of (soil) materials when used alone, the writer has made a few tests of compactness with various mixtures . . . which he has termed ' clay concrete ', the object always being to mix sufficient silt or clay with the sand to more than fill all the open spaces in the sand, and to mix with the gravel a sufficient volume of sand and silt or clay to more than fill all the open spaces in the gravel."

Dr. Fortier describes the construction of a hydraulic fill dam at Ogden, Utah, describing it as one of the first dams to be built with such careful control of the soil materials. He states that " earth deposited under water is free from the greater part of the air found in the open spaces." And he adds that " earth containing grains of different sizes packs better under water than in air."

With true scientific detachment Dr. Fortier states very clearly the limitations of the scientific studies which he made of soils. He suggests that at the time when he wrote, " knowledge of soil physics was too meagre to attempt of limiting the amounts of materials used to the same extent as one would in the construction, for example, of a railway bridge, or a roof truss." In view of his experiments, Dr. Fortier must have followed with unusual interest the study and recent growth of the new science of Soil Mechanics. He must have been encouraged that his early predictions were being at last confirmed, and he must frequently have smiled as he recalled the following words from his early paper—which even today are so meaningful: " For twenty years and over men have been testing the physical qualities of iron, steel, cements . . . Reservoir embankments on the other hand have been built in most instances without the requisite knowledge, upon mere guesswork, brawn and not brain predominating."

From Month To Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Another Engineer Appointed to Cabinet Rank

Announcement of the appointment on November 15th of another engineer, the Honourable Robert H. Winters, to the Federal Cabinet, as Minister of Reconstruction and Supply, will be welcomed by all members of the engineering profession. Mr. Winters takes over one of the portfolios previously held by the Right Honourable C. D. Howe, namely the functions of the Department of Reconstruction and Supply dealing with Housing and with the Reserve of Public Construction Projects. He also becomes Chairman of the National Film Board and assumes direction of the Canadian Government Travel Bureau.

Mr. Winters, who at 38 is the youngest member of the Cabinet, was born in Lunenburg, Nova Scotia. After obtaining the degree of B.A. at Mount Allison University in 1931, he continued his studies in engineering at the Massachusetts Institute of Technology, receiving the degrees of B.Sc., and M.Sc. Specializing in communications, he was employed as engineer by the Bell Telephone Laboratories at New York, the New York Telephone Co. and later with the Northern Electric Co. in Montreal, in connection with development and manufacturing. He joined the reserve army in 1937 with "B" Corps Signals, R.C.C.S. in Montreal and in 1942 went active as Captain in the Royal Canadian Ordnance Corps. Later he was transferred to the Royal Canadian Electrical and Mechanical Engineers, where he was concerned with the operation of all the Corps' workshops in the Dominion. In 1944 he saw service in connection with the establishment of R.C.E.M.E. workshops in Britain,

The Hon. R. H. Winters

Belgium, and Holland. He still holds the rank of Lieut.-Colonel in the Reserve of Officers.

He was elected to the House of Commons in 1945, representing Queens-Lunenburg, N.S. During the 1948 session he served as Parliamentary Assistant for Revenue Minister, the Hon. Dr. J. J. McCann, later taking over similar duties with the Minister of Transport, the Hon. Lionel Chevrier. On the retirement of the Rt. Hon. J. L. Ilsley from the government last summer the need for Maritime representation in the Cabinet called for a member of Parliament from a Nova Scotia riding. As an already experienced member of the "Junior Cabinet", Mr. Winters was chosen to head the Ministry of Reconstruction and Supply at the time the Right Honourable Louis St. Laurent succeeded to the office of Prime Minister.

With the continuing emphasis on housing, and the increasing importance attached to the preparation of the Reserve of Public Projects in the event of the need arising to bolster employment, should a recession threaten, the appointment of an engineer to this important portfolio is a particularly fortunate choice. Through his connection with the Canadian Travel Bureau he will also be directly concerned with the forthcoming cooperation between the Dominion and the Provinces for the completion of the Trans-Canada Highway.

Prairie Provinces Water Board

In the papers which were delivered at the Prairie Water Problems session at last year's annual meeting and were published in the September issue of the *Journal* most of the authors indicated the urgent need for the formation of a Prairie Provinces Water Board.

It was during the Banff meeting that announcement was made from Ottawa that such a board was to be formed and a telegram was sent by the Institute's Committee on Prairie Water Problems indicating the committee's belief that the decision would meet with wide approval.

The Prairie Provinces Water Board met for the first time in

Regina on November 1, 1948, to begin its studies of the interprovincial streams of Manitoba, Saskatchewan and Alberta. The members are: L. B. Thomson (chairman), director of P.F.R.A., Regina; N. Marr, M.E.I.C., acting controller, Dominion Water and Power Bureau, Ottawa; D. M. Stephens M.E.I.C., deputy minister, Manitoba Department of Mines and Natural Resources, Winnipeg; G. N. Munro, M.E.I.C., chief engineer, Saskatchewan Water Rights Branch, Regina; B. Russell, M.E.I.C., director, Alberta Water Resources Branch, Edmonton. W. M. Berry, M.E.I.C., hydraulic engineer, P.F.R.A., Regina, has been appointed acting secretary to the Board.

Attention Again Called to Low Salaries

Attention was directed to the currently critical shortage of engineers in public service, and the reasons therefor, in an address by James L. Wickwire, M.E.I.C., Assistant Chief Engineer, Department of Highways and Public Works of Nova Scotia, delivered at the Canadian Good Roads Association Convention at Digby last September and published in the November 1948 issue of *Roads and Bridges.* Mr. Wickwire's remarks referred primarily to highway engineers, but were intended to include, and apply to, nearly all engineers in public service.

Lack of competent engineers in highway work, he said, was assumed to be a temporary condition due to the war, but it is only now becoming evident in its real proportions. Less than three per cent of the engineering graduates from 120 American engineering colleges polled last year, expressed " an interest " in highway work, not even an intention to engage in such employment.

The typical Resident Engineer, who directs the work of much more highly paid contractors' superintendents, received $2400. a year in 1939. Today, with the cost of living up some 60 per cent, and the income tax a serious matter he receives $3200., an increase of 33 per cent. He should be receiving $5000. The Division Engineer, who has under him a large organization consisting of engineers, superintendents, foremen and equipment, and directs the maintenance of from one to two thousand miles of highway costing up to $2 millions a year, received a salary of $3000. in 1939. Today he gets $3700. or an increase over 1939 of 23 per cent, where he should be receiving up to $6000., in order to attain the same modest standard of living he had in 1939. The cost of living index would have to be pushed back from its present peak of 160 to well below 100 before the engineer in public service would be bailed out of his present predicament.

Thus we expect to get a first quality product in a resident or division engineer, without paying for it and as Mr. Wickwire points out even a first quality product like a hunk of prime western beef gets more consideration. A few years ago it fetched about 30 cents a pound and is now reaching for $1.00. Furthermore the engineer has to eat the beef.

For far too long engineering services have not been properly appreciated or adequately rewarded. During the war there was a vast demand for technical and engineering services and this need has been growing ever since. The engineer is today being valued more highly than ever by all forms of business, except the highway business, which is one of the biggest businesses of all, but through failure to compete with rival engineering fields in salaries and other advantages, highway departments are not attracting the engineer.

Perhaps after all the engineer would have been wise to include his group in one of the giant labor organizations. He has not done so, because his code of conduct and the nature of his thinking and work creates an instinctive dislike of resorting to strikes, and to tactics employed or threatened by those organizations. He is beginning to wonder, though, if he may not after all be forced to adopt some form of concerted action to hasten the recognition of his value to the community. He observes the marked increase since 1939 in the pay of bricklayers, and carpenters etc., and even in the pay of common labour and he knows by what methods these increases were brought about.

The author's remarks refer to a question to which the Engineering Institute has directed attention on many occasions in the past. Because of failure to make the proper adjustments in salary scales, our highway systems will suffer, our road transportation will cost us more dearly, and our tourist business " take " will diminish. Similar results already are, or will be, observed in other categories of public service. The Engineering Institute heartily concurs in Mr. Wickwire's remarks and compliments him on his timely reference to the issue.

British Publications for Canada

For many years it has been a part of Institute policy, to secure for members, the publications of other societies at special prices. In *The Engineering Journal* of November 1948 was printed a list of publications for which such arrangements have been made already. It is now possible to include in the list the *Journal of the Institution of Civil Engineers.* This publication sells to non-members at 5s-0d per copy but is offered to members of the Engineering Institute, post free, for 3s-6d.

The *Journal* is published monthly from October to May—or eight times a year. Subscriptions in Canada should be sent to the Headquarters of the Institute at Montreal.

It is part of these agreements that the publications of the Engineering Institute be offered to members of the co-operating societies at the same price as is charged our own members. In this way *The Engineering Journal* has found its way into distant places. The inter-change of publications between societies with similar purposes in different parts of the world is good for the profession.

Canadian Soil Mechanics Conference

Canadian workers in the field of soil mechanics recently assembled in Ottawa under the auspices of the Associate Committee on Soil and Snow Mechanics of the National Research Council. This was the second conference of its kind and it brought together practically all those actively connected with this new branch of engineering activity. About sixty engineers and scientists from Nova Scotia to British Columbia met for two days to discuss their common problems.

The Second International Conference on Soil Mechanics and Foundation Engineering was held in Rotterdam, Holland, during the summer of 1948. At this great gathering were over five hundred delegates from all parts of the world and the record of the technical papers presented will fill seven large volumes. The Canadian delegates were Dean R. M. Hardy, M.E.I.C., of the Faculty of Applied Science, University of Alberta, Edmonton; Dr. N. W. McLeod of the Department of Asphalt Technology, Imperial Oil Ltd., Toronto; F. Lionel Peckover, M.E.I.C., Division of Building Research, National Research Council, Ottawa; Robert Peterson, M.E.I.C., soil mechanics engineer, P.F.R.A., Regina; and D. C. Watt of the Hydro Electric Power Commission of Ontario; and these men were in attendance at the recent Ottawa meeting to describe the impressions they had gained at Rotterdam. In this way it was possible for all Canadian workers in this field to benefit from the world-wide fund of information assembled at the Rotterdam meeting. Many special Canadian problems caused by the various types of soil which are found in different parts of the Dominion were discussed against the background of these international presentations.

At the Rotterdam meeting, an International Society of Soil Mechanics and Foundation Engineering was set up. At the recent Ottawa meeting, the first steps were taken towards the formation of a National Canadian Group which will be a constituent part of the new International Society. Mr. R. F. Legget, director of the Division of Building Research of the National Research Council was elected to continue as Chairman of the National Group.

Meeting of Building Officials

In response to numerous suggestions from building officials throughout Canada, and in order to provide a means for full discussion of building codes, with special reference to the start of further work on the National Building Code and related publications, a meeting of building officials is to be held in Ottawa on the 28th of February and the 1st of March, 1949, under the auspices of the Associate Committee on the National Building Code.

The purpose of the meeting is to bring together for discussion of mutual problems, those municipal officials who are directly concerned with the enforcement of local building regulations, and architects, engineers and contractors who are interested in their use.

The meeting, which will be held in the Sussex Street Building of the National Research Council, will convene at 10 a.m. on Monday the 28th of February, 1949, and admission will be by invitation only. There will be no fees to be paid in connection with the meeting or its published records, and luncheons served during the meeting will be complimentary.

Engineers, architects and others interested in building regulations are encouraged to ask for invitations. They can be obtained from the above-mentioned Committee, Division of Building Research, N.R.C., Ottawa.

News of Other Societies

The Fifty-Second Royal Netherlands Trade Fair at Utrecht will be held from March 29 through April 7, 1949. Canadian businessmen who wish to visit this fair may obtain all information from Mr. Jan Overweel, 86 Adelaide Street East, Toronto, Tel. Plaza 1010. Mr. Overweel is the Trade Fair representative in Canada.

The **American Chemical Society** has circulated advance programme notes on its 115th National Meeting in San Francisco, March 28 to April 1, 1949. The Fairmount Hotel will be general headquarters of the meeting.

The office of the American Chemical Society is at 60 East 42nd Street, New York 17, N.Y.

The 1949 Annual Meeting of the **Canadian Institute of Mining and Metallurgy** will be in Montreal. The Windsor Hotel will be headquarters, and the dates April 25 to 28.

The Montreal office of C.I.M.M. is at 811 Drummond Bldg.

The Chemical Institute of Canada announces the scheduling of the 1949 Annual Meeting for May 29 to June 1, at Halifax, N.S.

General manager and secretary of the Chemical Institute is Mr. Garnet T. Page, 18 Rideau St., Ottawa.

The 52nd Annual Meeting of the **American Society for Testing Materials** will take place June 27 to July 1, 1949, at Hotel Chalfonte-Haddon Hall, Atlantic City, N.J.

Information can be obtained from the Society, 1916 Race St., Philadelphia 3, Pa.

A schedule of 1949 meetings of the **American Institute of Electrical Engineers** includes: the South West District Meeting, Dallas, Texas, at the Baker Hotel, April 19 to 21; the Summer General Meeting, Swampscott, Mass., at the New Ocean House, June 20 to 24; the Pacific General Meeting, San Francisco, Cal., at the Fairmont Hotel, August 23 to 26; and the Midwest General Meeting, at the Netherland Plaza Hotel, Cincinnati, Ohio, October 17 to 21.

An A.I.E.E. Conference on Industrial Application of Electron Tubes is arranged for April 11 and 12, 1949, at the Hotel Statler, Buffalo, N.Y.

A.I.E.E. headquarters are at 33 West Thirty-ninth St., New York 18, N.Y.

The Spring Meeting of the **Society for Experimental Stress Analysis** will be held at Hotel Statler, Detroit, Mich., on May 19 to 21, 1949.

Inquiries should be addressed to the Society, P.O. Box 168, Cambridge 39, Mass.

The 1949 Convention of the **Canadian Section of American Water Works Association** will take place April 25 to 27 at the Chateau Frontenac in Quebec City.

Secretary-treasurer of the Section is Albert E. Berry, of the Ontario Department of Health, Parliament Bldg., Toronto, Ont.

The Seventeenth Annual Meeting of the **American Society of Tool Engineers** will be held March 10, 11 and 12, 1949, in Pittsburgh, Pa.

Further information can be obtained from Jno. M. Cannon Associates, Inc., 523 Penobscot Bldg., Detroit 26, Mich.

Correspondence

INSTITUTION OF NAVAL ARCHITECTS

10, Upper Belgrave St., London S.W. 1.

December 22, 1948.

The General Secretary,
The Engineering Institute.

It sometimes happens that important foreign members of this Institution come over here on business, or for a short visit. On such occasions, the Council would be glad to hear, if possible, beforehand, in case it may be possible for the President or other Members of Council to meet them and, if practicable, to offer hospitality.

I am, therefore, asked to write to you unofficially, in the hope that you may be able to let it be known that, whenever any prominent member of this Institution or other important person connected with shipbuilding is intending to pay a visit to this country, the Council would be glad to have the opportunity of knowing when he will be in London. Perhaps you would be able to send me a brief letter beforehand on these occasions?

Yours faithfully,

Captain (S) A.D. Duckworth, R.N.
Secretary.

Personals

Notes of the Personal Activities of Members of the Institute

F. C. Askwith, M.E.I.C., of the staff of the city of Ottawa, has retired as the city's commissioner of works, after seventeen years in that position. He had entered the service of the municipality in 1907, and worked as chief draughtsman, sidewalk engineer, roadway engineer and deputy city engineer before his appointment as Commissioner.

W. J. W. Reid, M.E.I.C., recently elected president of the Association of Professional Engineers of Ontario, is president of the Otis-Fensom Elevator Company Limited, Hamilton, Ont.

Mr. Reid is active in professional, academic, and business associations. He is vice-president elect of the Engineering Institute, and a member of the Executive Committee, Canadian Manufacturer's Association, Hamilton-Brantford Branch. As a member of the Canadian Standards Association, Mr. Reid took a leading part in the framing and promotion of a Standard Elevator Safety Code for Canada.

E. V. Buchanan, M.E.I.C., has been elected first vice-president of the Association of Professional Engineers of Ontario. He is general manager of the London Public Utilities, London, Ont.

W. H. M. Laughlin, M.E.I.C., of Proctor, Redfern and Laughlin, Toronto, Ont., has been named second vice-president of the Association of Professional Engineers of Ontario.

W. M. Scott, M.E.I.C., who since 1920 has been chairman of commissioners, Greater Winnipeg Water District, and since 1937 also chairman of commissioners, Greater Winnipeg Sanitary District, retired from that position on January 31, 1949.

At the request of the Administration Boards, however, he will continue as one of three Commissioners, all of whom will serve on a part-time basis.

W. J. W. Reid M.E.I.C.

P. B. Stroyan, M.E.I.C., has been elected president of the Association of Professional Engineers of British Columbia. He is superintendent of the Vancouver Parks Board, and an engineering graduate of University of British Columbia. Mr. Stroyan is the immediate past-chairman of the Vancouver Branch of the Engineering Institute.

D. D. Morris, M.E.I.C., of the Consolidated Mining and Smelting Company, Trail, B.C., was recently appointed general superintendent of the research and development division of the Company. Previously he was general superintendent of the Alberta Nitrogen Department, Cominco's chemical operations in Calgary.

Mr. Morris first joined the Company's staff in 1928 as an assayer. He transferred in 1936 to research in the chemical and fertilizer plants, and in 1940 became assistant general foreman of the ammonia group. In 1941 he was appointed superintendent of the ammonia plant at the Alberta Nitrogen Department at Calgary, and he held this position until his appointment to general superintendent there in July, 1943.

R. S. Woodford, M.E.I.C., recently was appointed general superintendent of the Alberta Nitrogen Department of Consolidated Mining and Smelting Company of Canada, Limited.

Mr. Woodford joined the Company as a prospector in 1927 soon after his graduation from the University of Alberta, where he received a B.Sc. degree

D. D. Morris, M.E.I.C.

in honors physics. He worked as assayer, shift boss, foreman and assistant superintendent of several plants at Trail previous to his appointment in 1946 as staff supervisor of the personnel division. In January, 1947 he was appointed assistant general superintendent of the Alberta Nitrogen Department, which position he leaves to take up his new duties.

C. D. Wight, M.E.I.C., was named Commissioner of Works for the City of Ottawa early in January. A Queen's University graduate, class of 1928, he joined Ottawa's engineering staff in 1932. He received appointments as assistant roadway engineer and city surveyor, and as assistant waterworks engineer, and was made assistant commissioner of works in 1942. He has been chairman of the Advisory Council of the Ottawa Area Planning Board.

James S. Cameron, M.E.I.C., vice-president of the Northern Electric Company, was elected mayor of Westmount, Que., in January, 1949.

Mr. Cameron was born in Stellarton, N.S., but studied mechanical engineering in Montreal, graduating from McGill University in 1908. He joined Northern Electric Company here in 1910 as a factory engineer. When the Northern Electric and Manufacturing Company and Imperial Wire and Cable Company, Limited, were amalgamated in 1914, under the name of Northern Electric Company Limited, Mr. Cameron became the company's first superintendent of plant. He was subsequently superintendent of the cable shop, assistant general superintendent, telephone division manager, supervisor of manufacturing, and assistant general manager of manufacture. His appointment as vice-president (manufacture) was announced in December last.

J. S. Cameron, M.E.I.C.

Rene Dupuis, M.E.I.C., chief engineer of the Beauharnois Light, Heat and Power Company, Beauharnois, Que., was recently appointed to the board of the Quebec Hydro Commission.

Mr. Dupuis, a past-chairman of the Quebec Branch of the Engineering Institute, has been with the Beauharnois Company since 1947. He had previously been on the faculty of Laval University.

A. B. Normondin, M.E.I.C., vice-president of the Provincial Electricity Board, Quebec, Que., was recently appointed technical adviser to the Provincial Government on hydraulic resources and hydro electric developments.

Colonel C. R. Boehm, M.E.I.C., is acting director of mechanical engineering, at Army Headquarters, Ottawa.

A graduate of University of Toronto in 1929, in civilian life until 1939 his work was in mining, lastly as mine manager for Denison Nickel Mines Ltd. He was appointed an ordnance mechanical engineer in the R.C.O.C. then, but transferred to the R.C.E.M.E., in 1944.

Matthew Balls, M.E.I.C., has been named assistant vice-president of the Shawinigan Water and Power Company, Montreal. He will continue to direct operations of the water resources department, of which he has been manager since 1941.

Mr. Balls began his career as an engineer on railway survey and construction in British Columbia, the western states and Alaska. In 1916 he became an hydraulic engineer in the Dominion Department of the Interior, and for 10 years was engaged in irrigation and water power surveys in B.C. and the Yukon. He joined the Shawinigan Company in 1926.

George A. Cowan, M.E.I.C., heads the new Edmonton Branch of the Railway and Power Engineering Corporation Limited.

Mr. Cowan has been with the Corporation since 1941 as a sales engineer located at the Winnipeg Office. He graduated from the University of Saskatchewan in mechanical engineering, and is a member of the Association of Professional Engineers of Alberta, and of the Canadian Institute of Mining and Metallurgy.

E. G. Cullwick, M.E.I.C., has been appointed professor of electrical engineering at University College, Dundee, Scotland.

Professor Cullwick was educated in England and was appointed assistant professor of electrical engineering at the University of British Columbia in 1928. He went to the University of Alberta in 1937 as professor and head of the department of electrical engineering.

He was on war service with the Navy in 1942 to 1946 with the rank of commander, and was awarded the O.B.E. for his work in organizing the electrical engineering branch of the service. He has been director of electrical research for the Defense Research Board in Ottawa since 1946.

Walter K. Dow, M.E.I.C., is now in private practice as a consulting electrical engineer in Montreal. He was formerly with the Canadian Comstock Co. Ltd., Montreal. Mr. Dow is a graduate of University of Toronto, class of 1937.

R. H. Garrett, M.E.I.C., has been appointed distribution designer in the electrical division of the B.C. Electric Company at Vancouver. He was formerly transit research assistant in the transportation division of the Company, which he joined in 1947. He had previously been in engineering work in Vancouver, after serving for several years in Canada and overseas with the R.C.A.F.

J. M. Hopkins, M.E.I.C., has recently been appointed to the application engineering division of Canadian General Electric Company.

Mr. Hopkins graduated in electrical engineering from Nova Scotia Technical College in 1942. He received C.G.E.'s "Test" training and was for a time with the Company's engineering service department. After service during the war in the R.C.N. as a lieutenant, he returned to Nova Scotia Technical College for two years as an assistant professor.

Donald L. MacKinnon, M.E.I.C., was appointed some months ago managing director of Bayside Company Ltd., Campbellton, N.B. He was previously superintendent of Foundation Maritime Ltd., at Summerside, P.E.I. He had been with the Foundation Company of Canada Ltd., Montreal, from the time of his graduation in 1939 from the University of New Brunswick, and he rejoined the Company in 1946 after service with the R.C.A.F. He then worked in Toronto as manager of the building department of Foundation Co. of Ontario Ltd. He went to Summerside in 1947.

John J. Rowan, M.E.I.C., of Imperial Oil Limited, has been transferred to the Sarnia section of the Company. He is in the engineering and development division there. He joined the company in 1936 and has been located in Montreal. He had graduated in 1935 with a B.A.Sc. degree in civil engineering from Ecole Polytechnique, Montreal, and in 1936 had received a B.Sc. degree in mechanical engineering from Massachusetts Institute of Technology.

Matthew Balls, M.E.I.C.

Lyle G. Trorey, M.E.I.C., is chief engineer and technical director of Photographic Surveys (Western) Ltd., of Vancouver, B.C. Mr. Trorey resigned some time ago as director of Aerographic Surveys Limited, of London, England, and as chief engineer of Aero Surveys Ltd., Vancouver.

G. A. Antenbring, M.E.I.C., has accepted a position as sales engineer with the E. Long Company of Orillia, Ont. He was previously an industrial engineer with Canadian Johns Manville Company, Asbestos, Que.

C. W. Bickers, M.E.I.C., has rejoined the Ford Motor Company of Canada in Windsor, Ont., as a member of the industrial engineering department, in charge of plant layout. He left the Company in 1946 and has since worked with the Kaiser-Frazer Corporation. Willow Run, as supervisor of the plant layout department; with Mechanical Handling Systems, Detroit, Mich., as a design engineer; and most recently with the Link-Belt Company in Chicago, Ill., as a design engineer on conveyors and material handling.

Jacques Leroux, M.E.I.C., has been named assistant to the Montreal district engineer of the Marine service of the Deırtment of Transport. A graduate of cole Polytechnique, Montreal, class of 939, he was for a time in the Depart-ent of Public Works of Canada be-re going to the Department of Trans-ort as an engineer on construction of ıe airport at Mont Joli, Que. He rved overseas with the R.C.E., was emobilized in 1945 and returned to the Department.

. J. Morrow, JR.E.I.C., has been awarded master's degree in chemical engineer-ıg by Princeton University. He re-eived a B.Sc. in 1947 from McGill Uni-ersity, Montreal.

Visitors to Headquarters

Marley Sparling, Toronto, Ont., director of the University of Toronto Alumni Federation, Toronto, January 7.

F. J. B. Humphrys, of Shawinigan Water and Power Ltd., Victoriaville, Que., January 7.

John Grieve, M.E.I.C., executive secretary, Canadian Institute of Steel Construction, Toronto, Ont., January 12.

James O'Halloran, M.E.I.C., chief engineer, Anglo Canadian Pulp and Paper Mills Ltd., Quebec, Que., January 27.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Colonel Alexander Macphail, M.E.I.C., former head of Queen's University engineering department died on January 13, 1949, in hospital in Kingston, Ont.

Born at Orwell, P.E.I., in 1870, Col. Macphail was educated at Prince of Wales College, P.E.I., and McGill University, Montreal, where he took honours in civil engineering. Following graduation from McGill, he took post-graduate studies at Heidelberg, Germany.

At the outbreak of the First World War, Col. Macphail became officer commanding the First Division Engineers. He had a distinguished military career, and was awarded the Distinguished Service Order in 1915 and the C.M.G. in 1919. He won the Belgian Croix de Guerre and was five times mentioned in dispatches.

He first went to Queen's University in 1904. He rejoined the staff in 1919 and was made head of the department of civil engineering. He held this post until 1939 when he retired. At that time he was awarded an honorary LL.D. degree. He held a similar degree from McGill University. He continued to edit the Queen's (Quarterly) Review until 1943. In 1939, Col. Macphail was awarded the Meritorious Medal for "meritorious contribution to the honour of the university."

Col. Macphail was also a poet and during his service overseas he met the late Rudyard Kipling. Of Colonel Macphail the famous poet said: "He built bridges with one hand and wrote poetry with the other." However the only poem Col. Macphail ever published was one entitled "An Unmarked Mound", which was included in "The Book of Sorrows" edited by his late brother, Andrew Macphail.

Col. Macphail was granted Life Membership in the Institute in 1939. He had joined as a Member in 1906.

J. M. Campbell, M.E.I.C., president of the Gananoque Electric Light Company, passed away in hospital in Kingston, Ont., on January 1, 1949.

Mr. Campbell, who was born at Perth, Ont., in 1862, was a pioneer in the electrical field in Canada. Before the turn of the century he was associated with the Royal Electrical Company, prior to the formation of the Canadian General Electric Company. He supervised installation of some of the first generating stations built in Canada. He also had charge of the installation of many of the earliest street railways in Ontario, Quebec and British Columbia. He was general manager of the Buffalo, Lockport and Rochester, N.Y. Railway Company from 1908 to 1911.

Mr. Campbell began his career operating a flour and feed mill in Verona, Ont. In 1884 he transferred the business and plant to Kingston, Ont., and later adopted the name of the Kingston Milling Company Limited. Becoming interested in electrical development, he organized the company which installed the first electric light plant in the city. The plant was enlarged twice and in 1893 was moved to the present site of the Public Utilities Commission. The city acquired the plant at that time, and the transfer of machinery was directed by Mr. Campbell, who acted as manager for a time. The Kingston Electric Street Railway was constructed about this time under his supervision.

For some time Mr. Campbell supervised the construction and operation of an electric railway in Vancouver, B.C. Returning to Kingston he acquired the Gananoque Light, Heat and Water Supply Company.

Mr. Campbell was actively interested in navigation and operated the steamers *St. Lawrence* and *Brockville* on the Bay of Quinte and the St. Lawrence River. In his youth he was an ardent yachtsman and was a past commodore and charter member of the Kingston Yacht Club. He was an ex-chairman of the board of governors of the Kingston General Hospital, and a member of the board of trustees of Queen's University for many years. He was at one time a member of the Board of Trade in Kingston and was president for one term.

Mr. Campbell joined the Institute in 1907 as a Member. He attained Life Membership in 1947.

Dr. Jardine McKerlie, AFFILIATE E.I.C., formerly of Toronto, Ont., who had been at Searcy, Arkansas, since early in 1948, passed away there on November 13, 1948.

Dr. McKerlie was for four years, during the recent war, production manager of the Ontario-Great Lakes division of Wartime Merchant Shipping Limited in Toronto, directing production of naval and cargo vessels. At the end of the war he became sales manager for John Inglis Company, a position he held until he left for Harding College, an industrial education centre at Searcy, Arkansas, to be director of an expansion programme.

Born at Glasgow, Scotland, in 1896, Mr. Kerlie studied at Royal Technical College there, and completed an apprenticeship in shipbuilding. After service with the Royal Artillery in World War I, he returned to W. C. Martin and Co., Glasgow, as superintendent of electrical contracts on naval ships. He was later an electrical contractor on his own account. He became manager of Milligan's Wireless Station, Glasgow, in 1921, but two years later he came to Canada and took a position as chief engineer of Webb's Bakery in Toronto. He was for a short time sales engineer and transportation analyst for Ward Motor Vehicle Co., Mount Vernon, N.Y. He then worked for eight years in the electrical refrigeration and air conditioning sales and engineering fields in Montreal and Toronto. In 1934 he became editor of "Refrigeration and Air Conditioning", a publication of National Business Publications Limited, Gardenvale, Que., and he remained at that post for 4 years. Meanwhile he remained active in construction work, and was executive vice-president of the Canadian Refrigeration and Air Conditioning Association from 1936 to 1938. In 1937 he was also chairman of the Canadian Engineering Standards Association Committee on the mechanical refrigeration code.

In 1938 he became director of training for Industrial Training Systems Limited, Toronto. However, a year later he joined the Department of National Defence and was appointed inspector of guns and carriages in the M.G.O. Branch. In 1940 he was made assistant chief ordnance mechanical engineer in the Branch, and at the end of that year went to the General Staff of the Canadian Army as director of technical instruction. In 1941 he transferred to Wartime Merchant Shipping Limited.

Dr. McKerlie joined the Institute as an Affiliate in 1942.

Major H. C. de Blois, M.E.I.C., who died at the Queen Mary Veterans Hospital, Montreal, on December 13, 1948, after a lengthy illness, was born at Tweed, Ontario, in 1913.

Major de Blois graduated from Royal Military College, Kingston, in 1934, and was commissioned in the Royal Engineers. He attended Cambridge University where he obtained B.A. and M.A. degrees with honors in mechanical sciences, and he followed engineering courses in 1936-37 at Chatham, England, as a Royal Engineer Army Officer.

Before and during the Second World War he served in Egypt and Malaya and was reported missing in the fall of Singapore, but was later reported safe in Ceylon. Retiring from the Royal Engineers on medical grounds resulting from his service, he returned to Canada in September, 1944, and served with the Chemical Control office of the Department of Munitions and Supply. He later held a position with the Canadian Industries Limited in Shawinigan Falls.

Major de Blois joined the Institute in 1946 as a Member.

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G. R. HENDERSON
Sec.-Treas., C. P. STURDEE,
Engineering and Development Division, Imperial Oil Limited, Sarnia, Ont.

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Sec.-Treas., D. A. MACLEAN,
Ass't. Hydraulic Engineer,
Water Rights Branch,
Parliament Bldgs.,
Victoria, B.C.

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Chairman, H. W. McLEOD
Vice-Chair., C. V. ANTENBRING
Executive, I. S. PATTERSON
E. M. SCOTT A. M. THOMPSON
M. D. YOUNG R. H. TIVY
J. B. STRIOWSKI J. C. TRUEMAN
A. J. TAUNTON J. L. CHARLES
(Ex-Officio), E. P. FETHERSTONHAUGH
D. M. STEPHENS T. E. STOREY
R. T. HARLAND
Sec.-Treas., G. W. MOULE,
P.O. Box 541, Winnipeg, Man.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

January 21st, 1948

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate *

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the February meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BAKER—JOHN JACQUES, of Montreal, Que. Born at Bristol, Eng. Feb. 11, 1916. Educ.: B.Sc., (Mech. Engrg.), Bristol Univ., England, 1936; special mech. engrg. apprentice, Metropolitan Vickers Electric Co., Ltd., Manchester, Eng.; 1938-39, planning asst., Fairchild Aircraft Co., Ltd., Longueuil, Que.; 1939-40, jr. designer, Harland & Wolff, Belfast, Ireland; 1940-46, F/Lt., Engr. Officer, R.A.F.; 1947-48, designer, Dominion Engineering Works, Lachine, Que.; 1946, (6 mos.), stress analyst, Canadair Limited, Montreal, Que.; designer of hydraulic and allied machines at Hydraulic Machinery Co., Ltd., Montreal, Que.

References: J. H. Maude, E. Cowan, Z. Zorzi, W. K. Dow.

BAYS—NEIL REGINALD, of Moose Jaw, Sask. Born at Saltcoats, Sask., March 22, 1923. Educ. B.Sc., (Chem. Engrg.), Saskatchewan, 1944; Member, C.I.C.; 1944 to date, asst. chemist, testing of petroleum, products, lab. work in connection with refining processes, supervision of lab. staff, blending of petroleum products, British American Oil Co., Moose Jaw, Sask.

References: C. M. Thompson, I. M. Fraser, H. E. Hansen, R. A. Spencer, W. E. Lovell, R. L. Brown.

BOYSON—BERT WALTON, of Regina, Sask. Born at Raymond, Alta., Feb. 17, 1918. Educ.: B.Sc., (Civil Engrg.), Utah State Agricultural College, Logan, Utah, 1947, (course acc. ECPD); 1947 to date, irrigation engr., supervising irrigation and drainage planning and develop't., working in co-operation with PFRA on conservation projects, Saskatchewan Department of Agriculture, Regina, Sask.

References: G. L. MacKenzie, G. N. Munro, A. I. Bereskin, O. W. Martyn, W. M. Berry, E. S. C. Carpenter, H. R. Carscallen.

BROWN—GAVIN DOUGLAS, Baie Comeau, Que. Born at Ottawa, Jan. 1, 1925. Educ.: B.Sc., (Civil), Queen's, 1948; 1945, (summer), engrg. clerk, Dept. Mines & Resources; with Quebec North Short Paper Co., Baie Comeau, Que., as follows: 1946, (summer), instru'man., transit, level, plane table, 1947, (summer), party chief, topographic surveying, misc. engrg. studies, and at present field engr., woods engrg. dept.

References: S. J. Simons, G. H. Mikkelborg, W. F. M. Bryce, C. Miller, M. H. Jones.

DUBASH—SOLI DADABHOY, of Hamilton, Ont. Born at Bombay, India, June 22, 1923. Educ.: S.B., (mech. engrg.) Mass. Institute Technology, 1947, (acc. ECPD); R.P.E., Ontario; 1947-48, inspection engr., research and development, Canadian National Railways; 1948 to date, mech. engr., engrg. dept., Steel Company of Canada, Hamilton, Ont.

References: E. T. W. Bailey, R. E. Butt, N. Metcalfe.

HANNINGTON—FREDERICK AUGUSTUS, of London, Ont. Born at Saint John, N.B., April 26, 1909. Educ.: B.Sc., (Elect.), N.B., 1931; 1931-32, office man, mtce., repair dept., N.B. Power Co.; with Dept. Public Works, N.B., as follows 1932-35, rodman, highway divn., 1936, rodman, Saint John Harbour Commission; 1937-39, instru'man.; 1939-41, mtce. control equipt., boiler shop records, etc., Port Royal Pulp & Paper Co.; 1941-46, Lieut., R.C.E.; 1946, (part), jr. design engr., Stadler Hurter, Montreal; 1946, (part), jr. design engr., Abitibi Power & Paper Co.; 1947 to date, Veterans Land Act, London, Ont., first as clerk of works constrn., and finally as supvr. of constrn., Grade II.

References: D. J. Rosenberg, E. L. Toy, A. T. Hurter, J. R. C. Macredie, H. Lamb.

HELLSTROM—KLAS E. G., of Montreal, Que. Born at London, Eng., Feb. 11, 1923. Educ.: B. Eng., (Mech.), McGill, 1945; 1941-44 (summers), dftsman., Brompton Pulp & Paper; prod. control, D.I.L., Montreal; machinist helper, Canada Iron Foundries; dftng., Paper Machinery Ltd.; 1945-46, mech. engr., dftsman., Fraser Companies Ltd.; 1946-48, design engr., Karlstad Mekaniska Verstad, at present sales engr., Paper Machinery Ltd., Montreal, Que.

References: G. H. Midgley, F. O. White, A. T. Hurter, P. E. McIlhargey, J. S. Bates, D. A. Forbes, W. A. Ketchen, C. K. Lockwood.

JOHNSON—OSCAR IRWIN, of Trail, B.C. Born at Swift Current, Sask., Feb. 7, 1927. Educ.: B.Eng., (Civil), Saskatchewan, 1948; 1945, 1946 and 1947, (summers), laborer, Pacific Paper Mills Ltd.; instru'man., Dept. of Transport; jr. engr., Sask. Dept. of Reconstruction; and at present, engineer-in-training, Consolidated Mining & Smelting Co. of Canada, Trail, B.C.

References: E. Mason, A. C. Ridgers, A. L. Garvin, T. W. Lazenby, A. Baxter.

KUHRING—MALCOLM SHERATON, of Ottawa, Ont. Born at Toronto, Ont., Sept. 10, 1902. Associate, Royal Aeronautical Society; 1921-22, estimator and dftsman., Bennett and Wright, Toronto; 1922, aircraft constrn., Canadian Air Force (before formation of R.C.A.F.); 1922-23, machine shop work, Hamilton Gear & Machinery Co.; 1923-26, radio operator, C.N.R.; 1926-27 aircraft constrn., Canadian Vickers, Montreal; 1927-30, dftng. & inspecn., Reid Aircraft Co., Montreal; with National Research Council, as follows: 1930-31, experimental work and design of equipt. for aero, research, including wind tunnel, model towing basin and engine lab., 1931-35, i/c of lab., reporting to asst. director of divn., J. H. Parkin, M.E.I.C., aircraft engine research, research on fuels and lubricants, develop't. of hydrofoil smoke-laying craft, research on cooling of armoured cars, etc., etc., since 1935 have been associated with work in the United States, served on committees of Coordinating Research Council, Society of Automotive Engineers, National Advisory Committee on Aeronautics; at present, section head i/c engine lab., which implies full professional and administrative responsibility for direction of all phases of work of the staff of lab., reporting directly to Director of Division of Mech. Engrg., J. H. Parkin, National Research Council, Ottawa.

References: C. J. Mackenzie, J. H. Parkin, R. W. Boyle, B. G. Ballard, S. J. Murphy, A. Ferrier, J. J. Green, C. W. Crossland, H. S. Rees.

MILDREN—WALTER ALFRED, of Winnipeg, Man. Born at New Beckton, London, Eng., Feb. 24, 1923. Educ.: Ordinary National Certificate, Mech. Engrg., 1941; with Plessey Co., Ltd., Ilford, Eng., as follows: 1938-39, jr. dftsman. in tool drawing, 1939-41, jr. dftsman. in commercial radio dept., 1941-42, fitter, improver in model shop; 1942-46, F/Lt., R.A.F., in India; at present, dftsman., engrg. dept., City of Winnipeg, Man.

References: A. J. S. Taunton, J. B. Striowski, J. C. D. Taylor, W. L. Wardrop, N. S. Bubbis.

SHNIER—J. PHILIP, of Shawinigan Falls, Que. Born at Melfort, Sask., May 12, 1925. Educ.: B.Sc., (Chem. Engrg.), Univ. of Oklahoma, 1947, (acc. ECPD); 1947 to date, supervisor, resin unit, Canadian Resins and Chemicals, Shawinigan Falls, Que.

References C. G. deTonnancour, J. S. Whyte, M. Eaton, D. S. Ellis, A. Jackson.

SZUSKIEWICZ—WACLAW, of Toronto, Ont. Born at Smolensk, Poland, June 23, 1889. Educ.: Civil Engr., Technical Univ. of St. Petersburg, Russia, 1917; R.P.E., Ontario; 1912-17, railway development in Russia, and from 1917-18, works mgr.; 1918-24, chief of rly. section in Warsaw; 1925-34, chief of rly. divn.; 1934-44, consultg. and contractor for self; 1936-39, asst. professor, Faculty of Foundations, Technical Univ. of Warsaw; 1945-47, lecturer and director of technical courses (under education scheme), I Polish Parachute Brigade, British Army on Rhine; at present chief structl. engr., Bailey section, consultg. engrg. divn., H.E.P.C. of Ontario, Toronto, Ont.

References: E. P. Muntz, M. W. Huggins, C. P. Brzozowicz.

THOMPSON—RONALD EUGENE, of Montreal, Que. Born at Strongfield, Sask., May 19, 1925. Educ.: B.Sc., (Engrg. Physics), Sask., 1947; summers, 1944 to 1946 inclusive, rodman, PFRA, Sask. and Alta.; rodman, Imperial Oil Exploration Dept.; instru'man., repairman, Consolidated Mining & Smelting; 1947 to date, methods engr., telephone divn., Northern Electric Co., Montreal, Que.

References: R. A. Spencer, I. M. Fraser, A. Michaelenko, C. A. Peachey, J. H. Budden.

For transfer from the class of Junior

AUBRY—GERARD, of Montreal. Born at Montreal on March 9, 1916. Educ.: B.Sc. (C.E.) Ecole Poly. 1941; R.P.E. Que.; summers, 1937, planning, Mtl. Metropolitan Commission; 1938, instru'man, Que. Stream Comm.; 1939, underground general, Noranda Mines Co. Ltd.; 1940, surveying i/c party, Drainage Comm. Que.; June 1941-Oct. 1941, resident engr., Quebec Highway Dept.; 1941-42, R.C.A.F. Navigation Off. Flight-Lieut.; 1945-46, asst. chief, civil engineer'g. serv., Dept. Mines; at present, district engr. Dep't. of Public Works, Que. (St. 1939. Jr. 1943)

References: C. R. Laberge, H. Gaudefroy, J. C. Chagnon, A. Laplante.

BATEMAN—LEONARD A., of Winnipeg, Man. Born at Winnipeg on Jan. 14, 1919. Educ.: B.Sc. (Elect.) Manitoba, 1942; M.Sc. (Elec.) Man. 1948; R.P.E. Man. with Winnipeg Hydro as follows, 1942-45, junior engr.; 1945-47, jr. engr. various grades; 1947-48, engr. on elect. design; 1948 to date, operating engr. City of Wpg., Hydro Elect. System. (St. 1941. Jr. 1943)

References D. Hunter, H. L. Briggs, T. E. Storey, M. D. Young, A. M. Thompson, E. P. Fetherstonhaugh.

DINSMORE—CLARENCE SHERMAN, of Merrickville, Ont. Born at Thornbury, Ont., on Oct. 12, 1919. Educ.: B.A.Sc. (Engrg. Physics), Toronto, 1941; R.P.E. Ont. 1941-43, Federal Aircraft Ltd. material control dept. Mtl.; 1943-45, Alloy Foundry Inc. Merrickville; 1945-49. Grenville Castings Ltd., Mgr. and Director. (St. 1940. Jr. 1945)

References: W. A. Newman, H. G. Wong, G. G. C. Eastwood, J. G. Boultbee.

DUNN—JOHN THOMAS, of Montreal. Born at Ingersoll, Ont., on April 28, 1915. Educ. B.A.Sc. Toronto, 1937; asst. to county engr., Oxford County; with Dominion Rubber Co. Ltd. as follows: 1937-43, developt. engr.; 1943, asst. tech. control mgr.; 1943-45, tech. field engr.; 1945 to present, mgr. Hose, Belting & Packing Sales, D. R. Co. Ltd. (St. 1937. Jr. 1946)

References: R. Ford, A. P. Benoit, O. R. Brumell, R. R. Noyes, W. E. Patterson, G. E. Smith.

EVANS—OWEN ALLEN, of Sault Ste. Marie. Born at Sault Ste. Marie on Jan. 6, 1909. Educ.: B.Sc., Queen's, 1933; summers, 1930, instru'man Dept. of Northern Development; 1931, furnace research, Fitzgerald Research; 1932, underground, Hollinger Mine; 1933, assayer and millman, Minto Gold Mine; 1933-41, mines dept. Algoma Central & Hudson Bay Railway, asst. engr. on mtce. surveying, design of structures, inspection, genl. calculation; also 1941-48, engr. as relief man in inspection of mining properties at times for Algoma Ore Properties.

References: A. M. Wilson, G. W. MacLeod, J. L. Lang, L. R. Brown, K. G. Ross, R. A. Campbell, C. Stenbol, A. E. Pickering.

FARSTAD—CHARLES, of Edmonto, Alta. Born at Meskanaw, Sask., on Oct. 24, 1914. Educ.: B.Sc. (Mech.), Sask., 1941; 1941-42, asst. engr. Cons. Paper Corp., Grand'mere, Que.; 1942-45, St. Maurice Chemicals Ltd. Allied War Supply Corp. Project No. 38, Shawinigan Falls, Que.; with Burns & Co., Calgary: 1945-46, asst. plants engr.; 1946 to date, mech. supt., Edmonton, Alta. (Jr. 1941)

References: W. A. Smith, H. R. Hayes, J. E. Poole, J. E. B. Cranswick, I. M. Fraser, N. B. Hutcheon.

HAILEY—ARTHUR ROBERTS TRAIL, of Peterborough, Man. Born at Vancouver on Nov. 15, 1914. Educ.: B.A.Sc., British Columbia, 1941; R.P.E., Ont.; with the Can. General Electric Co., Peterborough as follows: 1941-42, testman; 1942 to date engr. Motor & Generator Eng'g. Div. also engr. design of D.C. Rotating Machinery. (Jr. 1942)

References: H. R. Stills, B. Ottewell, J. L. McKeever, V. S. Foster, A. R. Jones.

HOFFER—ARNOLD HYMAN, of Schenectady, N.Y. Born at Hoffer, Sask., on Aug. 7, 1924. Educ.: B.Sc. (Elec.) Man., 1946; with P.F.R.A. as follows: 1945-46, surveying, foreman i/c dam constrn. at Hoffer, Sask.; General Electric Co., Schenectady, N.Y., as follows: 1947 (4 mos.), redesign of type "B" Electronic Tachometer; 3 mos. testing of railway motors and generators; Oct. 1947-June 1948, test constrn., design, mtce. of locomotive gas turbines, transformers; engr. i/c of design, constrn. of high speed drive used in rotor selection overspeed test pit; 1948 (7 mos.), member of Advanced Engineering Program, Schenectady,—electro mech, engr., technical education div., gen. elect., design engr. on rotating consulting assignments; turbine generator div. for mathematical analysis of core losses in large alternators (St. 1945. Jr. 1948)

References E. P. Fetherstonhaugh, W. F. Riddell, A. E. Macdonald, N. M. Hall, J. Hoogstraten, G. Herriot.

KANE—REDMOND JOHN, of Mtl. Born at Mtl. on Feb. 24, 1918. Educ.: B.Eng. (Civil), McGill, 1941; R.P.E., Que.; summers: 1936, dftg. Ventilating & Blow Pipe Co.; 1937, timber cruising, Dept. Forests & Land; 1938, instru'man and 1939, harbour and ship mtce. Quebec Streams Commission; 1942, dftg. Aluminum Co. of Canada Ltd.; with the R.C.N.V.R. as follows: 1942, training in naval ordnance and gun mtg.; 1943-45, gun mtg. officer at St. John Machine Shop; and Liverpool, Lunenburg, Shelburn, Naval Refitting Bases in Nova Scotia; 1945, training on H.M. Ships "Rodney, Birmingham" in engine and boiler rooms; with Dominion Bridge Co. Ltd. as follows 1945, structural dftg.; 1946 to date, structural designer, bldgs., bridges. (St. 1940. Jr. 1945)

References: R. S. Eadie, D. B. Armstrong, R. Robertson, W. Pugh, G. A. Brault, C. J. Pimenoff, G. O. Vogan, I. Brouillet.

KEAY—WILLIAM LOGAN, of Brantford, Ont. Born at Glasgow, Scotland, on Jan. 29, 1918. Educ.: B.Sc. (Civil), Man., 1943; M.Sc. (Sanitary) Public Health, Toronto, 1947; 1943-45, mtce. and constrn. R.C.N.V.R.; 1945-46, instru'man., Can. Nat. Railways; 1947 to date, asst. city engr. Brantford, Ont. (St. 1941. Jr. 1946)

References: A. E. Macdonald, W. F. Riddell, A. E. Berry, G. H. Richards.

KENNEDY—SAMUEL McNEE, of Hamilton, Ont. Born at Cannington, Ont., on Jan. 28, 1913. Educ.: B.A.Sc. (Civil), Toronto, 1936; R.P.E., Ont.; 1936-37 Toronto Iron Works Ltd., worked in detail and design dept.; 1937-40, detail and design depts. of plate and boiler dept., Dominion Bridge Co. Ltd.; 1940-44. eng. dept. Defence Industries Ltd.; 1944-48, works engr. Can. Industries Ltd. (Jr. 1941)

References: I. R. Tait, H. C. Karn, J. R. Auld, M. S. Macgillivray, A. S. Wall, C. D. Bailey, E. B. Jubien.

KIRKWOOD—JOHN GORDON, of Windsor, Ont. Born at Saskatoon on Oct. 25, 1918. Educ.: B.Sc. (Civil) Univ. of Michigan 1942, (Accred. E.C.P.D.); R.P.E., Ont.; with Canadian Bridge Co. as follows: summers, 1935, '36, '37, '38, '39, '40, timekeeping and student engr.; 1941, detailer; 1942-43, detailing; 1943-44, estimator; 1944-45, Royal Can. Navy; 1945-48, welding engr., Walkerville. (St. 1939, Jr. 1945)

References: P. E. Adams, W. G. Mitchell, A. C. Ryley, W. R. Mitchell, C. S. Neilson, W. P. Augustine.

KOBYLNK—DEMETRIUS FREDERICK, of Calgary, Alta. Born at Daysland, Alta., on Oct. 4, 1911. Educ.: B.Sc. (Elect.), Alberta, 1938; R.P.E., Alta., with Calgary Power Limited as follows. 1938-39, floorman, Hydro Plant; 1939-48, apprentice and asst. engr. (St. 1938. Jr. 1943)

References: H. Randle, T. D. Stanley, P. F. Peele, H. B. LeBourveau, F. T. Gale.

MALO—GERARD, of Sherbrooke, Que. Born at Mtl. on June 23, 1917. Educ.: B.A.Sc. (Civil), Ecole Poly., 1940; R.P.E., Que.; summers, 1938, clerk Lord & Cie, Mtl., with Dept. of Roads of Que. as follows: 1939, asphalt insp.; 1940-42, resident engr.; 1942-44, works and bldgs. eng., Dept. of National Defence for Air; Dept. Roads, Quebec, 1944-46, asst. divn engr., 1946 to date, divn. engr. (St. 1939. Jr. 1946)

References: A. Morrissette, A. Gratton, E. Gohier, M. Ostiguy.

RONCARELLI—JOSEPH ANGELO, of Ottawa, Ont. Born at Mtl. on Sept. 29, 1914. Educ.: B.Eng. (Mech.), McGill, 1938; 1938-39, mtce. engr. Hubbard Ltd.; joined Can. Elect. & Mech. Engrs., held various engrg. appointments; 1946 to date, army active force rank of Major, Ottawa. (St. 1938. Jr. 1946)

References: E. D. Gray-Donald, J. W. Bishop, C. R. Boehm, J. R. Dunlop, K. H. McKibbin.

SHARPE—RUSSELL NEVILLE, of Winnipeg. Born at Mount Forest, Ont., on May 29, 1916. Educ.: B.Sc. (Civil), Man., 1938; R.P.E., Man.; summers, 1938, foreman inspector, Dept. of Transport; 1939, demonstrator, Univ. of Man.; 1939-40, instrument man, P.F.R.A.; 1940-43, chief examiner, inspection and acceptance of aircraft, British Air Commission; 1943-45, aero. engr. R.C.A.F.; with Dept. of Public Works, Man., as follows: 1945-46, asst. drainage engr.; 1946 to date, materials engr., superv. research, testing, field operation, Winnipeg. (Jr. 1939)

References: C. V. Antenbring, B. B. Hogarth, G. B. Williams, W. H. Hunt, W. J. Milhausen, A. E. MacDonald.

SHARPE—THOMAS ALBERT A., of Oshawa, Ont. Born at Cranbrook, B.C., on April 6, 1919. Educ. B.A.Sc. (Mining), Toronto, 1941; R.P.E., Ont.; summers, 1939, mucker and timberman's helper, Frood Mine, Sudbury, Ont.; 1940, Hollinger Con. Mine, Timmins; 1941, jr. engr. underground, surface surveying, engrg. Siscoe Gold Mines; 1941 (6 mos.), Jr. engr. R.C.A.F. No. 1 Training Command, doing heating, plumbing, layouts of bldgs., hangers; Dec. 1941, mech. engr. Vector Engrg. Co., Toronto, also on loan to DeHavilland Aircraft and Gen. Motors of Canada; 1945 (9 mos.), petroleum engr., Shell Oil of Canada, Calgary; 1946 to date, civil engr. i/c constrn. contracts in the field, layout, engrg. reports, Dept. of Highways, Toronto. (Jr. 1944)

References: T. F. Francis, C. A. Colpitts, J. M. Smith, J. Walters, G. H. N. Monkman.

STEVENSON—HERBERT IRVING, of Pine Falls, Man. Born at Brandon, Man., on Feb. 4, 1916. Educ.: B.Sc. (Civil), Man., 1938; 1938-40, sales engr. later asst. engr. A. P. Green Fire Brick Co. Ltd.; 1940-42, shop inspector, Manitoba Bridge & Iron Wks.; 1942-45, Lieut. Royal Can. Engrs.; 1945-46, shop insp. Manitoba Bridge & Iron Wks.; 1947 to date, engr. Man. Paper Co. Ltd., Pine Falls. (St. 1938. Jr. 1946)

References: M. W. Turner, A. E. Macdonald, G. H. Herriot, E. Gauer, D. M. Stephens, N. Hall, W. F. Riddell.

TAYLOR—CHARLES GRAY, of Pembrooke, Ont. Born at Braeside, Ont., on Jan. 31, 1913. Educ.: B.Sc. (Civil), Queen's, 1940; R.P.E., Ont.; summers, 1938, jr. engr. hydraulic dept. H.E.P.C.; 1940, party chief, instru'man, Beatty & Beatty, Municipal Engrs. & Land Surveyors, Pembroke; 1942, instru'man, party chief, H.E.P.C.; 1942-45, Lieut. R.C.E.; with Beatty & Beatty as follows: 1945-46, jr. engr.; 1946, partner, Beatty & Taylor; 1947, mgr.; besides gen. work of firm, ran a base line in district of Thunder Bay the summer of 1947, for Dept. of Lands & Forest of Ont.; from Jan. to April 1948, ran another base line district of Cochrane; at present, private practice, civil engr. and Ont. Land Surveyor. (St. 1940. Jr. 1942)

References: R. A. Low, N. Malloch, M. C. S. Brown, J. W. Pierce, N. B. MacRostie.

WEBSTER—GEDDES MURRAY, of Yellowknife. Born at Yarmouth, N.S., on April 30, 1918. Educ.: Eng. Diploma and B.Sc., Dalhousie Univ., 1939; B.Eng. (Mining), McGill, 1941; R.P.E., Ont.; summers, 1938, survey of Inverness Coal Fields instru'man, N.S. Government; 1939, International Nickel Co., Miner, Frood Mine, Sudbury; 1940, miner, Pickle Crow Gold Mines, Ont., with Defence Industries Ltd., Verdun, 1941-42, technician; 1942-43, production foreman; 1943-44, production senior foreman; with Can. Industries Ltd. Nylon Div., Kingston, as follows: 1944-45, production foreman; 1945-46, asst. project engr.; 1946 production supervision; 1946-47, resident engr. LaSalle Yellowknife Gold Mines; Doris Yellowknife Gold Mines; Russ-Rae Mines Ltd.; 1947-48, consulting engr. private practice. (St. 1939. Jr. 1944)

References: J. A. MacGibbon, J. E. Thom, R. D. Bennett, J. E. Tremayne, J. A. Gordon.

WILKINSON—WILLIAM Cameron, of Ottawa. Born at Gagetown, N.B., on Jan. 1, 1913. Educ. B.Sc. (Elec.), New Brunswick, 1937; R.P.E., Ont.; 1937-41, transmitter developt. engr., Canadian Marconi Co.; 1941-44, research engr., radio branch, National Research Council, Ottawa; 1944-46, chief engr. Wired Radio Co. of Canada (subsidiary of Can. Line Material); 1946-47, contlg. engr. (in association with R. G. Griffin, Sydney, Australia); at present engr. radio interference section, radio div., Dept. of Transport, Ottawa. (St. 1939. Jr. 1940)

References: E. W. Farmer, H. O. Merriman, K. A. McKinnon, A. F. Baird.

WILSON—MURRAY EDGAR of Moncton, N.B. Born at Moncton on May 25, 1916. Educ.: B.Sc. (Elec.), N.B., 1937; summer, 1937, paving insptr. Milton Hersey Co. Ltd.; 1938-39, elect'l. contracting; with the C.N.R. as follows: 1940-41, elect. worker, Halifax Div.; Atlantic Region, 1941-44, elect. dftsman.; 1945-46, elect. inspectr.; 1947 to date, asst. elect. engr.; this period including six months in 1948 relieving elect. superv., Atlantic Region. (St. 1937. Jr. 1944)

References: T. H. Dickson, V. C. Blackett, B. E. Bayne, A. R. Bennett, W. C. MacDonald, A. F. Baird, E. O. Turner.

Transfer from the class of Student

GLYNN—WALTER SYLVESTER, of Toronto. Born at Nov. 26, 1918. Educ.: B.A.Sc. (Civil), Toronto, 1942; R.P.E., Ont.: 1940 (2 mos.), land surveying instru'man., Ont. Land Surveyors, Toronto; 1940-41, asst. resident engr. on yard area, paving, machinery, foundation, operation, layouts, Anaconda American Brass Co. Ltd.; 1942 (6 mos.), field engr., job office mgr., Preload Co. of Canada; 1942 (one mo.), asst. design engr. on prestressed reinforced concrete Research in Mtl., Foundation Co. of Canada; 1942-45, instructor in engrg. drawing, Univ. of Toronto; summers, 1943 and 1944, job engr., supt. J. Harold Glynn, Sheet Metal & Rooting Contractor, Tor.; with Chapman, Oxley & Facey—Marani & Morris, architects as follows: 1945-47, jr. structural engr.; 1947 (4 mos.), reinforced concrete design on factories; 1947-48, structural engr. (St. 1942)

References: E. P. Muntz, W. B. Dunbar, J. M. Oxley, M. W. Huggins, E. A. Cross, C. F. Morrison, R. V. Anderson.

NEWS of the BRANCHES

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Calgary

G. A. Hutton, jr.e.i.c.
Branch News Editor

T. M. Parry, m.e.i.c.
Secretary-Treasurer

A meeting of particular interest to members of the Calgary Branch of the Engineering Institute of Canada was held on November 18th, 1948, in the East Dining Room of the Hotel Palliser. The meeting was addressed by Dr. R. Hardy, dean of the faculty of applied science, University of Alberta, and Prof. Harle of the Electrical Engineering Department of the same University. The subject of the meeting was the application of electrosmosis to the mud slides which at present are occurring at a section of the North Calgary hillsides known locally as the Sunnyside Hill.

A section of hillside almost eight blocks long had shown signs of instability and evidence of slides occurring over a considerable period of years. Within the past three or four years a section about three blocks long has become increasingly active despite the fact that some drainage has been installed. Loose material from previous slides is behaving as a "mud flow" and has been encroaching steadily on the property and endangering the residences in this particular locality. Approximately forty thousand cubic yards of material is in an unstable condition in the mud flow. During the evening of May 8, 1948, the time of spring break, and following a heavy fall of rain and wet snow a new slide of catastrophic proportions occurred immediately west of the mud flow. About twenty thousand yards of material moved suddenly in this slide. Unless remedial measures are adopted it is to be expected that further slides will occur in the area.

Dr. Hardy enumerated the factors which have contributed to the condition, such as composition of the soil and climatic conditions, and he accounted for the increasing activity of the area. He told of the inquiry into the source of seepage water and consequent mud flow, and attributed responsibility to the general rise in ground water level which has occurred throughout the province in recent years.

Preliminary inspection and investigation indicated that extensive drainage works would be required to stabilize the bank and mud flows. The major problem in installing drainage works at this site is the difficulty of operating equipment on the soft wet material below the bank. Moreover the soil types involved tend to become water logged and are rather difficult to drain. For these reasons it was recommended that the process of "electrosmosis" be tried on the main mud flow. This involves forcing drainage by the passage of an electric current from the soil through anodes to well points acting as cathodes. This process also may be effective in controlling the direction of flow of seepage water, thus making it possible to prevent the sloughing of soft material into the excavation. It was realized that this adaptation to the particular circumstances at the Sunnyside Hill would be in the nature of a research project, but it had prospects of proving to be more economical than conventional drainage methods.

It is recommended that a graded sand and drainage blanket be installed over the whole area of the mud flow. The blanket must be placed below the frost line. In order to drain out the area to enable equipment to operate, it is recommended that the installation of a line of shallow well points be drilled along the upper side of the mud flow. This will provide sufficient drainage to permit equipment to operate on the slope. However, if necessary, additional stability may be provided by electrosmosis.

Prof. Harle followed Dr. Hardy with the explanation of electrosmosis, a natural phenomenon which was discovered in 1807. If a d-c voltage is applied along a capillary tube filled with liquid, displacement of the liquid along the tube occurs.

Prof. Harle's explanation of the theory and its application to the Sunnyside Hill was very well received by the members present. It was shown that there is a vast field of application for electrosmosis and other electrolytic phenomena in soil problems, but application or otherwise of these electrical methods will, as with all other engineering problems, be dictated by both the economic and scientific aspects of each problem.

Cornwall

G. G. M. Eastwood, M.E.I.C.
Secretary-Treasurer

T. B. Webster, M.E.I.C.
Branch News Editor

On January 11, the Cornwall Branch heard an illustrated lecture on **Processing Oils and Lubrication** given by Mr. G. E. S. Georges of the Canadian Oil Companies. About 50 were present including guests of the Cornwall Branch of the Chemical Institute of Canada who were welcomed by Chairman R. H. Wallace.

Mr. Georges has had 25 years experience in the petroleum industry. The first part of his lecture was covered by a technicolour film "Oil for Tomorrow" illustrating oil recovery operations from prospecting, discovery, and drilling, to the delivery of crude oil to the refinery. Scientific methods are used to guide in the location and estimation of crude oil pockets but Mr. Georges stated that still only one in seven wells are economically productive.

The speaker briefly described the refining processes in which the crude oil is distilled into its fractional components. Lubricating oils, constituting about 10 per cent of the crude oil, are treated to give desired properties by dewaxing, removal of impurities, and addition of compounds called additives. Additives are used to reduce pour point, increase resistance to oxidation, increase pressure resistance, and to give detergent properties to remove sludge. Mr. Georges spoke of greases which are dispersions of soap in oil. The properties of the grease depend on the element used in making the soap — the elements are aluminum, barium, sodium, calcium, iron, and lead. Barium and sodium give high resistance to heat, iron-based greases resist nitric acid, and lead greases withstand high bearing pressures.

In the discussion period after the lecture, Mr. Georges elaborated on oil well drilling operations. A short film, "Gasoline For Everybody", was also shown to illustrate refinery operations.

The speaker was introduced by H. W. Nickerson and thanked by G. M. Eastwood.

Edmonton

E. K. Cumming, M.E.I.C.
Secretary-Treasurer

A very successful dinner meeting of the Edmonton Branch of the Institute was held in Merrick's Embassy Room on Tuesday evening, November 23rd, with Vice-Chairman T. W. Dalkin presiding. Over eighty members attended to hear the guest speaker, R. M. Hardy, dean of the faculty of engineering at the University of Alberta, present a report on the Second International Conference on Soil Mechanics and Foundation Engineering. Dean Hardy was one of the five Canadian delegates to attend this Conference.

In his opening remarks Dean Hardy touched on his trip through Western Europe. He said that he had been privileged to visit the German cities of Hamburg, Hanover and Goettingen. In describing his trip through the Technical High School in Hanover the speaker remarked on the excellence of their soils and hydraulics laboratories and also upon the fact that the scientists at this school appeared to have lost touch with developments which had taken place in other countries during the war years. Another point of interest in the Dean's trip was the former Kaiser Willhelm Research Institute in Goettingen, which is now being re-organized as a centre for fundamental research in engineering, bio-chemistry, neurology and physics.

At the Conference itself, more than 400 papers were presented. The meetings were organized to provide discussion of the papers dealing with each of several major fields of interest in Soil Mechanics and Foundation Engineering. About 600 delegates attended from all parts of the world with the exception of Germany and Russia.

One of the most interesting points noted by Dean Hardy at the Conference and in his travels was that in European countries it is much more the general practice than in Canada to base the design foundations, roads and airport runways on the results of a complete soil survey.

Dean Hardy concluded his remarks by saying that in England and the Western European countries there were many more individuals and organizations specializing in the field of soil mechanics than in Canada, and that this work was being carried out not only by Government agencies, research stations and universities but also by specialized contracting firms. He stated that the Canadian delegates thoroughly enjoyed the time spent and that they were gratified with the enthusiasm with which the Canadian papers and ideas were received.

The speaker was introduced by Professor L. E. Gads of the University of Alberta and a vote of thanks which was enthusiastically endorsed by the meeting was moved by Bruce F. Willson.

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On the evening of December 15th, seventy-five members of the Edmonton Branch of the Institute and their guests were privileged to visit the plant of North-West Industries Limited.

Following a short business session, those in attendance were welcomed by B. W. Pitfield, M.E.I.C., general manager of he Company. Mr. Pitfield outlined briefly the operations carried out in the plant. He said that their main contract involved the fitting of ten Dakota aircraft with radar and communications equipment for the R.C.A.F. for training purposes. Mr. Pitfield introduced Mr. Robin Henry, who has been responsible for most of the design involved in this contract. Mr. Henry described briefly the equipment being installed in the Dakota aircraft, with many interesting remarks concerning the design problems involved.

The members were then shown through the plant where they had an opportunity to inspect the equipment as installed in a "mock-up" and in the aircraft. They were also able to examine other work being carried out in the plant which included the repair of many types of aircraft, the manufacture of Bellanca planes and the manufacture of truck and trailer bodies. The Bellanca planes, which are used in the North, were designed in this plant and many have given successful service in flying freight and passengers to the North country.

After seeing the plant the group returned to the company cafeteria and enjoyed an excellent lunch. A brief discussion ensued and a vote of thanks to Mr. Pitfield and his staff was moved by C. W. Carry.

Halifax

W. E. Jefferson, M.E.I.C.
Secretary-Treasurer

M. L. Baker, M.E.I.C.
Branch News Editor

In place of the regular dinner meeting in October, the members of the branch were invited to an inspection of the aircraft carrier, "*H.M.C.S. Magnificent*" at H.M.C. Dockyard. This inspection trip was made possible through the kind permission of the Commanding Officer, Commodore G. R. Miles, R.C.N. About 150 members availed themselves of the opportunity to see at first hand the many interesting features of this aircraft carrier.

Before the inspection proper began Commander (E) R. Balfour, R.C.N. outlined some of the functions of this type of naval craft. Following this talk the members gathered into small groups and under courteous and competent guides were conducted about the ship. A much appreciated social period was enjoyed after the tour.

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On November 8, the Halifax branch of the Institute and the Association of Professional Engineers of Nova Scotia were hosts to the graduating class of the Nova Scotia Technical College. This meeting was held at the Merchants Seamen's Club. W. C. Risley, Chairman of the branch presided.

C. M. Anson, general manager of the Dominion Steel and Coal Corporation, and past regional vice-president of the Institute, and J. D. Dunlop, president of the Students Council, Nova Scotia Technical College, were the guest speakers.

Mr. Dunlop, who was the student representative from the Nova Scotia Technical College to the student's conference at Banff, gave an excellent report on the proceedings of that conference.

The subject of Mr. Anson's address was **The Broad Approach to an Engineering Career.** Mr. Anson pointed out the necessity for a broad basis in engineering education, saying that while some emphasis has to be placed on the major fields of engineering, specialization to any considerable degree was not necessary. In setting out on his career, said the speaker, it is most important that the young engineer acquire an interest in human relationships.

Mr. Anson spoke of the engineering profession as one not always awarded according to merit. But there is immeasurable satisfaction in approaching a tough problem, and finally solving it. To drive home this thought he cited a recent problem that confronted him and his staff. A storm wrecked the pier at which the limestone for the blast furnaces was loaded for shipment to the steel plant. The story of the handling of the repair job was indeed an inspiration not only to the student but to the older engineer as well.

Lakehead

W. D. MacKinnon, M.E.I.C.
Branch News Editor

G. S. Halter, Jr.E.I.C.
Branch Secretary-Treasurer

A general dinner meeting of the Lakehead Branch was held on November 16 at the Royal Edward Hotel in Fort William at which the new executive was accepted and installed. The guest speaker was Mr. M. R. Brown, mining engineer on the staff of the Lakehead Technical Institute, Port Arthur, who told of the make-up of Lakehead Technical Institute, explaining its division into two main sections. One section is devoted to the training of capable technicians for industry and the other provides first year courses in arts and engineering equivalent to the first year in similar courses at other universities. The students who pass the arts and engineering courses will be accepted into second year at practically every university in Canada. Mr. Brown suggested that students at the Technical Institute be encouraged to join the Lakehead Branch of the Engineering Institute as student members. The school has a good reference library, especially on the subject of mining, and it is the aim of the staff to add to it, so that it will serve as a technical reference library for all industry at the Lakehead.

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A general dinner meeting of the Lakehead Branch was held on December 6, 1948, in the Orpheum Grill Dining Room in Port Arthur. Branch Chairman, W. E. Maclennan presided. Members of the staff and students in applied science at the Lakehead Technical Institute, Port Arthur, were present as guests.

Mr. MacLennan welcomed the guests and called on Dr. M. Bartley, principal of the Lakehead Technical Institute to introduce his staff and students.

The meeting took the form of a "round table" discussion of ways in which the Branch could aid the young engineer, and guide the student in the choice of his branch of engineering. C. L. Emery, co-chairman of the programme committee, began the discussion by introducing the branch executive. He stated that the Branch plans to make this a "Young Man's Year". For the first time there are students in engineering at the Lakehead, and the branch must give every help possible to the Technical Institute students in order to make the school a success. Several suggestions were received from members on the subject of aid to students, and on improvement of the Branch meetings generally. Mr. Cawley expressed the thanks of the Technical Institute.

The meeting concluded with the showing of two films "The Tennessee Valley Authority" and "Life in the Western Marshes".

Lethbridge

D. Cramer, Jr.E.I.C.
Secretary-Treasurer

A. E. Lawrence
Branch News Editor

Thirty-four members and guests of the Lethbridge Branch attended a dinner meeting in the Marquis Hotel, Saturday evening, December 18th, 1948.

The meeting was in the form of a musical and film programme. Vice-chairman R. D. Livingstone presided. Community singing led by R. S. Lawrence, recitations by A. J. Branch and vocal selections by Edgar Rannard were much enjoyed.

Three excellent films were screened by Mr. Ron Roberts. They included: "Instruments of Orchestras"—a film which explained the use of the different instruments in a large symphony orchestra; "Radiant Rockies"—a beautiful film showing the charms of the Rocky Mountain scenery; "Aluminum"—the story of the mining and manufacture of aluminum.

C. S. Clendening moved a vote of thanks to Mr. Roberts, which was heartily endorsed by all present.

Ottawa

C. G. Biesenthal, M.E.I.C.
Secretary-Treasurer

Capt. A. J. Bernard, M.E.I.C.
Branch News Editor

A regular luncheon meeting of the Ottawa Branch was held on December 2nd at the Chateau Laurier, Ottawa. Chairman J. L. Shearer presided.

Highlight of the meeting was a paper delivered by Norman Marr, acting controller, Dominion Water and Power Bureau, Department of Mines and Resources. Mr. Marr was very capably introduced by J. M. Wardle, director of Special Projects Branch, Department of Mines and Resources.

The paper **The Snare River, Hydro Electric Development,** was found very interesting by the large number of members present. In October, 1944, due to increasing power demands in the Yellowknife district, investigations were carried out on the Snare River by Mr. W. G. Stuart on behalf of Giant Yellowknife. Early in 1946 the Dominion Government took over the project for the purpose of assisting and expediting the economic development of the Territories. By Order-In-Council dated February 15, 1946, the Minister of Mines and Resources was authorized to proceed with the development and the task was delegated to the Dominion Water and Power Bureau under the direction of Mr. J. M. Wardle, then the Director of Surveys and Engineering Branch of the Department.

Giant Yellowknife agreed to continue, at cost, certain preliminary operations then underway and provide construction machinery for the site before the spring breakup. The Montreal Engineering Company were engaged to design the development and supervise construction. Construction was carried out by the Northern Construction - Mannix Companies on a cost-plus fixed-fee basis. The Transmission line was built by Giant Yellowknife to be taken over by the Government at cost. The development was first in operation October 4, 1948.

The site chosen for the main dam is a short distance from the outlet of Big Spruce Lake and about ten feet below lake level where the Snare River was divided into two narrow channels by a rock island rising about 40 feet above water level. An earth-fill clay-core, rock faced dam, 800 feet long, maximum height 73 feet and base width 420 feet, containing 170,000 cubic yards of material, was built. Materials for the dam were found in the vicinity. Sufficient rough lumber for the coffer dam and other construction was found on a point of Big Spruce Lake. This find was very fortunate as timber is very scarce in this area.

The main features of the development were given by the speaker, as follows: 8350 hp.; maximum head, 62 ft., average 56 ft.; storage area, 30 sq. mi.; main tunnel 16.5 ft. by 16.5 ft., length 136 ft.; penstock 13.5 ft. diameter, 40 ft. long; main turbine—S. Morgan Smith, Francis type, 8350 hp., 128.5 r.p.m. at 56 ft. head; main generator C.G.E., 7000 k.v.a., vertical 3-phase, 60-cycle, 6,900 volts, 128.5 r.p.m.; power house concrete substructure, steel frame superstructure with concrete block walls. Two supplementary dams were required on Big Spruce Lake to close depressions below the full reservoir level. One of these was designed as a spillway for surplus water.

The editor wishes to express the appreciation of all branch members to retiring branch news editor R. C. Purser, who due to health reasons could no longer carry on this activity. Best wishes are extended for a speedy recovery.

Peterborough

J. M. King, M.E.I.C.
Secretary-Treasurer

J. C. Allan, M.E.I.C.
Branch News Editor

An Engineer's Journey through China was the subject of an address delivered to the Peterborough Branch by J. K. Sexton of the Montreal Engineering Company on November 25, 1948.

Mr. Sexton made an extensive tour through China to study proposed sites for hydro electric development in 1946. Mr. Sexton reported that there were only 6,081 kw. of installed hydro electric capacity in all China exclusive of Manchuria and Formosa in 1946. In fact, that country's total installed capacity totalled only 690,400 kw. including both thermal and hydro power.

China's three-fold plan of post war power development projected: restoration of war-wrecked power plants and construction of small plants where most needed, and investigation of a number of medium sized projects and of several enormous projects for future construction. Of these the most famous is Yangtze Gorge hydro and navigation project. This would involve the installation of several million kilowatts of generating capacity. Although this project has captured the imagination of Chinese engineers it bears little relation to the present economy of the country.

For the investigation of the medium sized projects mentioned above, the Chinese government sought the assistance of Canadian engineers. The result was an agreement with the Montreal Engineering Company and the tour which Mr. Sexton described. Four typical sites at widely separated points were studied.

Mr. Sexton said that China, unlike Canada, is not a glaciated country and over its central area there are very few lakes indeed. Nor is there any snow storage such as serves to regulate the flow of our western rivers. In China the run-off is flashy, flood peaks are high, and the ratio of minimum to maximum flow is very low".

The floods in the upper Yangtze are phenomenal. In the gorge section they range from 47,000 to 2,100,000 c.f.s. and the river stage has varied over a range of 112 feet at Chungking. Mr. Sexton told of difficulties of shifting of gravels of the stream bed with consequent rapid filling of small reservoirs and large cost of large reservoirs.

In China all arable land, especially the irrigable land lying in valleys, is intensively cultivated and supports a dense population. Moreover there is no vacant land to which people may be moved. Hence the problem of water storage for power purposes by the flooding of land is of a social rather than an engineering nature. Some idea of the extent of the problem may be gained from the fact that on the Lung Chi Ho the creation of 350,000 acre feet of storage would involve moving 7,200 people. It is said that the Yangtze Gorge project would require the moving of 300,000 people.

Mr. Sexton said, "The most practical solution of the problem advanced so far, is the application of pumped irrigation to the arable lands lying at elevations beyond the reach of gravity, thereby making it possible to support a dense population and hence receive displaced people from reservoir sites."

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

A. R. Bonnell, M.E.I.C.
Branch News Editor

The annual dinner meeting of the Saint John Branch was held December 16 in the Admiral Beatty Hotel with the Chairman T. C. Macnabb presiding.

Following the annual report of the secretary-treasurer J. H. Maclure, discussion took place on the reports of the various committees.

It was decided after some discussion to hold two branch meetings a year in Fredericton to create a greater interest in the Branch by the Fredericton members. It was noted that the creation of a Fredericton Branch would create two weak branches instead of one strong one.

Mr. Macnabb in his retiring address stressed that engineers should become more active in fields of public life other than in their own profession. Speaking along professional lines Mr. Macnabb stated that engineers should be very careful in keeping records of their work, and in signing and dating plans.

The Branch officers were elected for the coming year and after a brief address by the new chairman, H. P. Lingley, the meeting adjourned.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bingo-Wo, M.E.I.C.
Branch News Editor

The regular joint monthly meeting of the Saskatchewan Branch of the Institute and the Association of Professional Engineers of Saskatchewan was held on Friday, December 17, at the Kitchener Hotel in Regina. A. A. Holland, M.E.I.C. consulting engineer, Sodium Sulphate Division, Saskatchewan Minerals, presented a film and address on the Sodium Sulphate plant at Lake Chaplin.

The sodium sulphate plant is one of the Crown Corporations owned by the Government of Saskatchewan and is located on Lake Chaplin, about sixty miles west of Moose Jaw. This is a natural deposit of 18 square miles in extent, situated in a semi-arid country.

During the spring run-off from the surrounding hills, sufficient water is provided to dissolve the sulphate or Glauber's Salts, which is carried into the lake bed in solution. Evaporation concentrates the salts to 45 or 50 per cent and the lake is covered to a depth of six to twelve inches. The brine is then pumped into three reservoirs, each covering an area of one million square feet. In all they hold 200 million gallons. The brine cools and about the middle of November the surface temperature will be around 30 degrees Fahrenheit. When this temperature is reached, nearly all of the Glauber's Salts will be deposited at the bottom of the reservoir; the more soluble salts, such as sodium chloride and magnesium sulphate will remain in solution.

Harvesting of the deposit begins as soon as the reservoirs are drained, and the salt is stockpiled on both sides of a 1100 foot conveyor belt that carries it into a raw salt bin in the factory. A screw conveyor then conducts the raw salt into Holland Evaporators where melting and evaporation takes place. Finally, the remaining salt cake, containing less than ¼ of 1 per cent moisture is discharged into a hot salt conveyor and on to a vibrating screen where the oversize is removed and crushed in a rodmill.

The present plant is producing at the rate of 100,000 tons per year and when completed will produce 150,000 tons per year.

Professor A. H. Douglas, of the University of Saskatchewan moved a vote of thanks to Mr. Holland.

Victoria

S. H. Frame, M.E.I.C.
Secretary-Treasurer

T. A. J. Leach, M.E.I.C.
Branch News Editor

The annual meeting of the Victoria Branch was held in Lougheed's Banquet Hall on the 20th December with the retiring chairman, Major R. C. Farrow, presiding.

Mr. R. Bowering was elected chairman for the coming year and other officers included: D. A. MacLean, secretary-treasurer; T. Hogg, T. A. J. Leach, Lt. Col. B. Ripley, J. N. Anderson and E. Smith on the executive board; S. H. Frame, past secretary and Major Farrow will serve as counsellors.

Major Farrow, Provincial Comptroller of Water Rights gave an address on the 1948 floods in B.C. He dealt in particular with the Fraser River, illustrating his address with coloured slides.

A late spring accompanied by a high snow residual in the low areas and with increased water content in the higher snow courses, all pointed to a flood hazard and warnings were given at the beginning of May. With a peak discharge of 536,000 c.f.s., the 1948 Fraser River flood was ¾-foot below the 1894 flood level at Mission. However, due to the greater population area affected, last spring's flood caused the most extensive damage on record.

The speaker pointed out that many of the dykes date back to the eighties and that their maintenance was under the direct supervision of the local Dyking Boards. Haphazard selection of material used in their construction became apparent in times of flood. The location of borrow pits near the toe of the dykes resulted, in some cases, in the removal of impervious material opening the way for seepage.

Dyke construction in tidal areas is governed by high and low tide levels. In these areas Seward Dykes are employed. The design of River Dykes further upstream is dependent upon the maximum flood level.

It was pointed out that in no case did failure of a dyke occur by overtopping. However prolonged high water produced shear failure along the longitudinal axis of the dyke, as well as seepage. The heavy growth along the dykes added to the difficulties of the flood fighters in their efforts to place sandbags. Theirs was a job of constant vigilance and with the first signs of a boil, sandbags were rushed to the scene. Wherever possible such boils were walled around by sandbags. Water rising within this improvised reservoir equalized the hydrostatic pressure from the river.

In conclusion the speaker pointed out that at the present time reconstruction of the dykes is being carried out under the Fraser River Dyking Board. Added study is also being given to flood control by storage on the 850 square miles of lakes within the Fraser River watershed. For the present the reconstruction of dykes on a massive standard followed by good maintenance is necessary. More dredging of the Fraser River channel itself is also called for.

Winnipeg

G. W. Moule, M.E.I.C.
Branch Secretary

R. H. Tivy, Jr.E.I.C.
Branch News Editor

Electrical Section

J. C. Pratt, M.E.I.C.
News Editor

The Annual Dinner and Dance culminating the 1948-49 season's activities of the Electrical Section in Winnipeg will be held on the evening of March 4th in the Marlborough Hotel. D. A. McCuaig will be in charge of the arrangements, assisted by E. M. Scott.

Please!

If you have not completed and returned the yellow reply card which was sent to you in January —*DO IT NOW.* The postage is three cents.

Thank You!

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

CHEMICAL SALES ENGINEERS, one required in Montreal, one for Winnipeg. Graduates preferred. Positions offer excellent opportunity to develop to management. Salary depends upon qualifications. Apply to File No. 1092-V.

CHEMICAL ENGINEER with about one year's experience to carry out plant research work on product improvement. Position in Toronto. Approximate starting salary $225. per month. Apply to File No. 1097-V.

CHEMICAL ENGINEERS required by chemical company in Toronto for sales engineering. One recent graduate for training in sales also one with about one year's experience. Approximate starting salaries $200 to $225 per month. Apply to File No. 1097-V.

CHEMICAL ENGINEER OR CHEMIST with some experience in the manufacture of pulp, paper and converted products required for Province of Quebec to take charge of the testing staff of a sub-section of the technical dept. under the general direction of the Technical Superintendent. Salary open. Apply to File No. 1098-V.

CHEMICAL ENGINEER required by large western industrial manufacturing concern. Applicant must be interested in boiler water treatment. Salary open. Apply to File No. 1103-V.

CHEMIST, recent graduate, required by chemical company in Western Ontario to take charge of control laboratory. Experience not essential but desirable. Salary open. Apply to File No. 1111-V.

CIVIL

CIVIL ENGINEER required for a Consulting Engineers Practice in the Maritimes. Preferably with three to six years experience. Duties both design and field supervision of construction for both municipal works and industrial buildings. Engineering survey experience required. Salary open. Apply to File No. 1087-V.

CIVIL ENGINEER, age 35 to 40 years, required by Public Institution for Montreal area. Must have construction experience and be able to supervise large building program. Salary $6,000 to $7,000. Apply to File No. 1091-V.

CIVIL ENGINEER to take charge of design and construction of service buildings, required by expanding chemical company in Western Ontario. Salary open. Apply to File No. 1111-V.

ELECTRICAL

JUNIOR ELECTRICAL ENGINEERS required as assistants to Works Engineers by a large chemical manufacturing company with Headquarters in Montreal. Applicants should have passed the C.G.E. Test course. Positions in Ontario. Salary open. Apply to File No. 1084 V.

ELECTRICAL ENGINEER, recent graduate, required for Canadian branch plant of a progressive, established American company. Duties to be production control working closely with sales. Permanent position for right man with excellent opportunity for advancement. Location Toronto. Salary open. Apply to File No. 1088-V.

ELECTRICAL DESIGNING ENGINEER required for plant engineering department. Preferably between the ages of 30-40 years, with 10 years of electrical design experience in industrial plant construction and maintenance. Position in Ontario. Salary open. Apply to File No. 1100-V.

ELECTRICAL ENGINEER, preferably with experience in electrical trouble shooting and maintenance work required by industrial firm in Toronto. Salary open. Apply to File No. 1101-V.

ELECTRICAL ENGINEER required in Latin America as assistant to Manager on Public Utility system. Must have broad experience in operation and maintenance of generating plants, sub-stations, transmission lines and distribution systems. Ability to speak Spanish desirable but not essential. Salary open. Apply to File No. 1112-V.

MECHANICAL

MECHANICAL ENGINEER with considerable experience in all kinds of Brass-Valves (including foundry work) required as Production Manager in Ontario. Must be alert and aggressive. Salary open. Apply to File No. 1009-V.

RECENT GRADUATE Mechanical Engineering, required by Canadian firm for work on test plant layout and design of special test equipment. Position offers interesting work in the new field of Gas Turbine Jet Engine development. Salary open. Apply to File No. 1089-V.

SENIOR MECHANICAL ENGINEER required by chemical company in Toronto to act as chief Engineer. Must be able to do process design work and prepare capital cost estimates. Approximate starting salary $400 per month. Apply to File No. 1097-V.

MECHANICAL ENGINEER, required as Plant Engineer by a pulp and paper mill in the Province of Quebec. Should have about ten years experience, the major part in the pulp and paper industry. Applicant will be required to take complete charge of maintenance department consisting of various trades crews with a total personnel of about 250 men. Salary open. Apply to File No. 1099-V.

MISCELLANEOUS

GRADUATE ENGINEER required by Montreal head office of a large Canadian Company for design, specification and layout of air conditioning, ventilating, fan and duct work for industrial processes, factories, offices, dust removal collecting systems, etc. Supervision of field installations, testing and making estimates. Must be familiar with all kinds of relative apparatus and equipment and with sheet metal air duct work. At least five years' experience with the above. Please give full details of experience, training, age, references, salary expected and date available. Apply to File No. 1015-V.

JUNIOR CIVIL AND MECHANICAL ENGINEERS required by large Canadian pulp and paper mill. Preferably some experience in pulp and paper mill engineering problems but experience not essential. Salaries open. Apply to File No. 1082-V.

GRADUATE ENGINEER required as sales promotion Manager by well established manufacturer of heating equipment used in all types of buildings. Age 30 to 40 years with experience in selling Mechanical equipment in the construction industry and preferably with Business Administration Course. Salary open. Apply to File No. 1085-V.

AIRCRAFT STRESS ENGINEERS AND DESIGN DRAUGHTSMAN required by Canadian company. Must have aircraft design experience or at least two years experience in stressing of aircraft structures. Salary open. Apply to File No. 1089-V.

GRADUATE ENGINEER, 30 to 40 years of age with 3 or 4 years experience in railroad engineering required in Montreal to take charge of railway division. Must be bilingual. Salary open. Apply to File No. 1090-V.

GRADUATE ENGINEER preferably electrical or mechanical required to fill the position of Assistant Superintendent of the Street Railway Department of a Saskatchewan city. Salary around $3,600 per year. Apply to File No. 1093-V.

SALES ENGINEER for contractors equipment and allied lines required by large manufacturer, Niagara Peninsula. Salary open. Apply to File No. 1095-V.

HEATING AND VENTILATING ENGINEER with some experience in mechanical equipment for buildings, is wanted for office work on heating, ventilating and air conditioning by firm of consulting engineers in Montreal. Salary open. Apply to File No. 1096-V.

GRADUATE ENGINEER with management ability, about forty-five years of age required by Industrial Corporation operating several branches. Experience should cover plant lay-out, production planning, job simplification, warehousing and supervision of personnel. Salary open. Apply to File No. 1102-V.

GENERAL OPERATING SUPERINTENDENT required by large electric utility company in the Far East for three large interconnected hydro-electric generating plants. Applicants must be thoroughly experienced in operation and maintenance of hydro-electric generating equipment. Salary open. Apply to File No. 1112-V.

DISTRIBUTION ENGINEERS required in Latin America must have at least five years experience on design and operation of overhead electric distribution systems. Salary open. Apply to File No. 1112-V.

*SALES ENGINEER required by large manufacturer of industrial products and building materials with offices in Montreal to reside in Sydney, N.S., and contact industrial accounts, building materials dealers and contractors in Cape Breton and Newfoundland. Experience in steel and/or chemical engineering an advantage but not essential. Salary open. Apply to File No. 1113-V.

* Filled since appearance in advance notice.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER, recent graduate, is needed for production work by chemical manufacturing firm situated in the Province of Quebec. Some experience in chemical production of synthetic resin manufacture would be advantageous. Salary open. Apply to File No. 1064-V.

JUNIOR CHEMICAL ENGINEER required by independent oil company located in Turner Valley. Duties will include design and supervision of maintenance and new construction work. Advancement will depend on initiative and readiness to assume responsibility. Salary open. Apply to File No. 1075-V.

CIVIL

CIVIL ENGINEER to act as assistant to Senior Officer of a well-established general contracting firm in Montreal. Applicant should have about five years experience and have some knowledge of all phases of building construction. Salary open. Apply to File No. 1038-V.

*CIVIL ENGINEER required for Consulting Engineers office in Western Canada. Must have extensive experience water, sewer and pavement layouts capable of taking charge office staff and field parties. Partnership offered to right man. Salary open. Apply to File No. 1042-V.

CIVIL ENGINEERING GRADUATES with several years experience in building construtcion and estimating for permanent senior and junior positions in Winnipeg. Good prospects and pension benefits. Starting salary $250.00 and up per month with yearly increments. Apply to File No. 1061-V.

ELECTRICAL

ELECTRICAL ENGINEER with at least five years experience in Central Station and Substation installation and maintenance required by a Maritime Public Utility. Apply to File No. 1043-V.

ELECTRICAL DESIGNING DRAUGHTSMAN for work in Southern Ontario. Must be experienced. Salary up to $300. Apply to File No. 1059-V.

ELECTRICAL ENGINEER required as assistant to electrical superintendent by a textile manufacturing concern in Montreal. Applicant must have had good experience and be willing to accept responsibility. Salary open. Apply to File No. 1070-V.

RECENT GRADUATE, electrical background, required as sales engineer by a manufacturer in Montreal. Salary open Apply to File No. 1071-V.

ELECTRICAL ENGINEER with industrial background preferably pulp and paper required for senior position in electrical department of a paper mill in the Ottawa valley. Salary open. Apply to File No. 1073-V.

RECENT GRADUATE in Electrical Engineering required for Sales Engineering Work with old established Montreal firm. Must have had at least two years practical experience and be willing to travel occasionally. Apply to File No 1094-V.

MECHANICAL

MECHANICAL ENGINEER required by a large industrial plant in the East end of Montreal for product design work on major electrical appliances. We are prepared to offer definite advancement in a reasonably short period of time and salary will be based on potentiality rather than experience. Apply to File No. 1016-V.

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 1029-V.

MECHANICAL ENGINEER, recent graduate, required for Engineering Department of a farm implement manufacturer in Ontario. Salary open. Apply to File No. 1030-V.

*MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary colliery plant, screening equipment, hoists, simple steel structures, etc. Salary $240 up, depending upon ability. Apply to File No. 1032-V.

MECHANICAL ENGINEER preferably with a few years experience and some knowledge of pulp and paper required for design and layout by a company in New Brunswick. Salary open. Apply to File No. 1036-V.

SENIOR MECHANICAL DRAUGHTSMAN required by a machinery manufacturer in Central Ontario. Salary open. Apply to File No. 1044-V.

*MECHANICAL ENGINEER with industrial background required as sales engineer by a consulting firm in Montreal. Salary $300 up according to experience. Apply to File No. 1049-V.

*MECHANICAL ENGINEER with 5 or more years experience in industry, preferably pulp and paper required by manufacturer in Province of Quebec for duties involving organization of improvements, job schedules, machinery maintenance and some mechanical draughting. Salary $300-$350. Apply to File No. 1052-V.

MECHANICAL ENGINEER with two or three years experience in chemical or allied industries required by chemical plant in Central Ontario. Salary open. Apply to File No. 1066-V.

MECHANICAL ENGINEER required as assistant to mechanical superintendent by a textile concern 35 miles south-west of Montreal. Must have had good experience and willing to accept responsibility. Salary open. Apply to File No. 1070-V.

MECHANICAL ENGINEER, experienced on design and construction of fine instruments wanted to take charge of small model shop in laboratory specializing on development of air-borne radar and aerial survey and navigation aids, servomechanisms and computors. Advancement in rapidly expanding and progressive organization assured for capable engineer. Salary open. Apply to File No. 1074-V.

*MECHANICAL ENGINEER required by an established manufacturing company in Toronto to layout and plan new building in the Toronto area. Opportunity for permanent employment. Reply stating age and experience. If possible attach a recent photograph. Salary open. Apply to File No. 1079-V.

METALLURGICAL

RECENT GRADUATES in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 1029-V.

MISCELLANEOUS

JUNIOR ENGINEER preferably with civil background required for sales and service by a Montreal manufacturer of water-proofing compounds. Salary open. Apply to File No. 1033-V.

SALES ENGINEER under 35 years of age, preferably with engineering and sales experience required in Toronto, to become a specialist in capacitor sales. Salary according to qualifications and experience. Apply to File No. 1035-V.

GRADUATE ENGINEER with engineering and sales experience required as a Street lighting specialist in Toronto area. Position involves direct sales engineering with municipalities and utilities, also engineering and production problems, directly concerned with the manufacture of street lighting equipment. Age under 35 years. Salary open. Apply to File No. 1035-V.

MECHANICAL OR ELECTRICAL ENGINEER required as Montreal representative of a Canadian manufacturer with Headquarters in Ontario. Preferably some sales experience. Salary open. Apply to File No. 1039-V.

GRADUATE ENGINEER for urban transportation system 25 to 40 years of age with at least five years experience. Hydro-Elect. plant operation experience essential. Steam or diesel electric generating plants desirable. A knowledge of time and motion study and evaluation would be a definite advantage. Salary open. Please send photograph and full particulars of education and experience. Apply to File No. 1041-V.

GRADUATE ENGINEER required by a consulting engineer in Montreal. Must have experience in boiler plant design and general knowledge of heating. Salary open. Apply to File No. 1048-V.

DRAUGHTSMAN required by industrial organization in Toronto. Must have plant and structural experience. Salary open. Apply to File No. 1051-V.

MECHANICAL OR CIVIL ENGINEER with 3 or more years experience in industry, preferably pulp and paper required by a manufacturer in Province of Quebec for duties involving study and preparation of improvement projects, such as, installation of machinery, pip.ng, etc. Salary $250 to $300. Apply to File No. 1052-V.

MINING OR METALLURGICAL ENGINEER capable of taking charge of a plant control laboratory for plant and control work, required by a manufacturer in the St. Maurice Valley. Age should be between 30 to 40 years. Salary open. Apply to File No. 1054-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experience in installations of production and cost control. Wage incentives etc. Free to travel. Preferably bilingual. Salary open. Apply to File No. 1058-V.

SALES ENGINEER 24 to 30 years of age, preferably single and free to travel required by Canadian manufacturer of industrial rubber products. Must have a minimum of 1 to 2 years post-graduate experience in mining or plant maintenance. Salary open. Apply to File No. 1060-V.

*SENIOR ENGINEER required by Montreal contractor to supervise engineering and power development work in Ottawa area. Salary $425.00 up. Apply to File No. 1062-V.

*INDUSTRIAL ENGINEER preferably with mechanical or chemical background and some experience in industrial engineering work, including plant layout and time study required by chemical company in Toronto. Apply to File No. 1065-V.

DESIGN ENGINEER for concrete machinery and mixers required by well established Ontario manufacturing company. Good opportunity. Good salary. Apply to File No. 1067-V.

RECENT GRADUATE preferably mechanical or electrical background required by National Beverage Company. Training period in Montreal. Salary open. Apply to File No. 1069-V.

ELECTRONICS ENGINEER and Technicians experienced on design and construction of radar, servomechanisms, computors or magnetometers required for development laboratory specializing in airborne devices for aerial survey and navigation. Advancement in rapidly expanding and progressive organization assured for capable personnel. Salary open. Apply to File No. 1074-V.

*SALES ENGINEER required for sales staff of a manufacturer in Toronto. Preferably background in Mechanical, Chemical or Mining engineering. Salary open. Apply to File No. 1076-V.

SENIOR TIME STUDY MEN required by large National Organization in Ontario. Must be competent in methods improvement and have experience in developing standard data on machine tool and other operations. Salary open. Apply to File No. 1078-V.

JUNIOR ENGINEER OR ARCHITECTURAL DRAUGHTSMAN for city planning office in Western Canada. State education, experience, age and salary desired. Apply to File No. 1080-V.

GRADUATE CIVIL ENGINEER or ARCHITECT required for Saskatchewan community, about 6,000 population, to act as town planner under consultant, and as assistant to City Engineer. Interest in civic problems desirable. State education, experience and age. Apply to File No. 1080-V.

INDUSTRIAL ENGINEERS, must be fluently bilingual, two residents of Quebec City, one Bois Franc Region, one Grand'Mere, five Montreal, wanted by New York firm of Management Consultants, members of American Management Association contemplating to organize a branch in the Province of Quebec. Salary, Commission and travelling expenses. Apply to File No. 1083-V.

JUNIOR SALES ENGINEER, preferably bilingual, to be trained for sales work with Montreal Industrial Company. Salary open. Apply to File No. 1086-V.

* Filled since appearance in advance notice.

Situations Wanted

MECHANICAL ENGINEER, age 39, experienced in tool design and production methods, material selection, production records, control and co-ordination. Desires employment preferably in Montreal with either manufacturer or firm of Engineers who could utilize all or a part of above experience. Apply to File No. 551-W.

ELECTRICAL ENGINEER, Jr.E.I.C., Manitoba, '44, married, age 27, presently situated in Maritimes desires active position in Central or Western region. Field service engineering, C.G.E. test course, Army radar experience. Interested in plant engineering, installation or development openings. Apply to File No. 846-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Sc. (E.E.), Manitoba, 1943. Age, 27. Married. Electrical experience with R.C. Signals and 2½ years general electrical experience in industry. Sales training. Presently employed but desires position offering wider scope and opportunity. Preferably Montreal area. Apply to File No. 925-W.

GRADUATE MECHANICAL ENGINEER (McGill), M.E.I.C., P.Eng., Ont. 26 years experience including Oil refinery design, plant layout, structural design, pressure vessels, central station boilers and furnaces both design and specifications; surveys and reports on power plant and factory efficiency problems, inspection of installations, and supervision of maintenance on heating, ventilation and air conditioning of military and Air Port buildings, and fuel storage depots. War veteran, employed but desires renumerative responsible position on West Coast. Would consider partnership with Consulting firm. Apply to File No. 991-W.

ENGINEER, M.E.I.C. Graduate Civil and Electrical. Age 40, single. Experience covers engineering and building construction and maintenance, works maintenance, general and heavy construction machinery sales and service, shop management. Past seven years in executive and administrative capacity. Seeks wider opportunities or position leading to same in business, engineering, or business engineering. Free to travel, any location including foreign, available one month notice. Apply to File No. 1266-W.

ELECTRICAL ENGINEER, M.E.I.C., P.E.Q., B.Eng., McGill '34, age 40, married, Bilingual. 15 years Sales and Service of industrial electrical and welding equipment. At present in charge of Sales and Administration for Canadian company. Desires position of responsibility with well established progressive company. Location preferably Quebec or Ontario. Home in Montreal. Available on short notice. Apply to File No. 1421-W.

CIVIL ENGINEER, S.E.I.C., P.Eng., B.Sc., doing post graduate study in Montreal requires part time employment preferably week-ends at home. Experienced in various steel plate construction designs. Will also accept draughting and miscellaneous engineering work. Apply to File No. 1487-W.

*SENIOR MECHANICAL ENGINEER, M.E.I.C., B.Eng., McGill '34, desires responsible position with a future. Presently employed with firm of chemical consulting engineers. Previous experience includes several years in charge of airplane design, planning, cost estimating and construction. Accustomed to directing technical staff and shop operations. Apply to File No. 1511-W.

GRADUATE CIVIL ENGINEER, M.E.I.C., P.Eng., Que. Experience in the Engineering Department of large Corporations. Considerable experience in Hydraulic and design and building of Reinforced concrete structures. Several years as Construction & Field Engineer on various plants and Hydraulic Power Projects. Desires position with well established firm. Presently employed. Apply to File No. 1527-W.

SALES ENGINEER, B.E. (Electrical), N.S.T.C., M.E.I.C., Professional Engineer Nova Scotia, age 35, married. Presently employed in Halifax. Ten years experience successfully selling, and supervising the selling of a variety of electrical equipment. Excellent contacts in Maritime Provinces and Newfoundland. Interested in position as branch manager, or district representative in Maritimes, on salary and commission. Would also consider being manufacturer's agent. Apply to File No. 1758-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Ontario, age 38, married. 14 years extensive structural experience in reinforced concrete and structural steel design and layout. Interested in association with well established progressive organization as Engineering Assistant or Chief Draughtsman. Present salary $5,000. Apply to File No. 2049-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. (Alta.). Age 29, B.Sc. Married. Presently employed. Experience in light commercial construction and housing projects. Familiar with project planning and utility layouts. Have organized and supervised several large construction projects, have good background in lumber and building supply business relative to the construction industry. Some experience in highway location and construction, sewer and water distribution and natural gas installations. Interested in partnership with consultant engineer or architect, or position with progressive construction firm, would consider oil company. Home Edmonton, Alberta. Apply to File No. 2521-W.

MECHANICAL ENGINEER, Jr.E.I.C, Sask. '46, P.Eng., Ont. 23, married. Experience primarily in Pulp and Paper Industry in maintenance engineering, layouts and small construction jobs. Earnestly desires to enter Industrial Engineering field either with Consulting Engineer of Industrial Methods or Production Department. Location immaterial, available experience most important. Available on one month's notice. Apply to File No. 2795-W.

ENGINEERING PHYSICIST, Jr.E.I.C., Sask. '47, age 24, Prof. Eng., Ont. Single. Desires research work in progressive company. Preferably in Ontario or West. Experience includes six months outside plant of Bell Telephone, Montreal, 14 months ass't Engineer with Miniature Electric Motor Manufacturing Company. Duties are Research and test of design and materials plus plant control and maintenance. Presently employed, available one month's notice. Apply to File No. 2917-W.

MECHANICAL & INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44, 7 years industrial experience. Welding application and metallurgy, production supervision, production specifications, purchasing, wage incentives, time study,

* Employed since appearance in advance notice.

stimating, costing, design. Available 4 eeks notice. Apply to File No. 2920-W.

EMICAL ENGINEER, M.E.I.C., P.Eng., ith considerable mechanical experience in plant construction, piping layouts and welding, 14 years industrial ractice on positions of responsibility, esires a change of employment preferbly in Montreal area. Bilingual. Apply o File No. 2940-W.

CHANICAL ENGINEER, M.E.I.C., Prof. ng. (Quebec), 15 years of shop practice in maintenance and locomotive repair; 5 years machinery design, including welded vessels, process piping nd pulp mill layout. Seeking responsible position preferably in Montreal rea. Available on short notice. Apply o File No. 3045-W.

ECHANICAL ENGINEER, S.E.I.C., B.A.Sc., Toronto, age 26, single, experience in operation planning and detailing, also sales. Presently employed with Importers as Correspondent and nterpreter. Languages: English and German perfect; French reading knowledge only. Desires employment as industrial engineer, preferably in Toronto rea. Apply to File No. 3065-W.

LES ENGINEER, S.E.I.C., recent graduate in Mech. Eng., N.S.T.C. At present very successful N.S. representative of Non-Engineering Organization, also desires to represent Engineering firm as well, part time or full time. Apply o File No. 3068-W.

ECHANICAL ENGINEER, A.M.I. Mech.E., P.Eng., Que. Graduate London, 935; age 37, married, 10 years experience in design, testing and installation supervision of all classes of I.C. engines, supercharging, steam machinery and plant layout in the U.K. 3 years technical executive and administrative experience in policy and production with responsibility of Government level. Trilingual, English, German, Russian. Desires responsible position covering design, administrative or sales with progressive and reliable employers, anywhere in Canada. At present resident in Montreal. Apply to File No. 3069-W.

ART TIME WORK, Graduate Civil Engineer, B.A.Sc., Jr.E.I.C., now doing graduate work in Montreal. Desirous of obtaining part time work in concrete and steel design or cost estimating. Apply to File No. 3073-W.

RADUATE MECHANICAL ENGINEER, 39, single, 14 years experience in research engineering, instrumentation, automatic controls, testing of materials and machinery. Knowledge of metallography, heat-treatment, and welding. Several languages. Acquainted with optical and electrical equipment, emergency maintenance of plant and motor transport. Desires suitable position requiring initiative. Apply to File No. 3074-W.

ART TIME WORK, 3rd Year Electrical Engineer, McGill S.E.I.C. Anxious to obtain part-time employment, preferably in electrical field. Have considerable free time aavilable. Summer experience in textile plant also telegraph department of railroad company. Apply to File No. 3075-W.

ECHANICAL ENGINEERING STUDENT, S.E.I.C., 2nd year at McGill University, member, Society of Motion Picture Engineers, age 21, single. Interested in obtaining summer employment with prospects of permanent position in precision mechanical engineering field (instruments, meters, motion picture equipment). Machine shop experience, languages. Apply to File No. 3076-W.

RADUATE ENGINEER, Toronto '42, M.E.I.C., P.Eng. (Civil Branch), age 30. Married. Overseas veteran with R.C.E.M.E. Experience in Mining and Metallurgy. Presently engaged in all phases of railroad construction and maintenance of way including estimating, general design and layout work. Desires change to position of professional responsibility in Municipal Engineering or Industrial work in smaller firm. Preferably Toronto or neighborhood. Now completing two year course in Business Methods. Apply to File No. 3077-W.

IVIL GRADUATE, S.E.I.C., B.Sc., Queen's, age 25, married, veteran. Experience limited to survey work and varied shop experience. Desires a position with a consultant or with a town planner. Available on short notice. Apply to File No. 3078-W.

ALES ENGINEER, M.E.I.C. Electrical and Mechanical background, bilingual, 12 years service in Navy and 6 years with Wartime Shipbuilding and War Assets in technical and executive capacity. Interested in representing Firm in Montreal area. Available immediately. Apply to File No. 3081-W.

MECHANICAL ELECTRICAL ENGINEER, S.E.I.C., graduating in May from Ecole Polytechnique seeks position with progressive industrial firm. Age 26, single. Good Mechanical background. Employed during war with National Research Council. Ambitious, with good character and potentialities. Apply to File No. 3083-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc. Prof. Eng. Age 33. Married, no children, bilingual, seven years experience in the following fields: one year in hydro-electric power house operation, three years planning and supervision in shipbuilding, two years in design and supervision of irrigation works; one year as Construction Engineer in charge of the construction of a dam. Available in June, 1949. Presently employed in Ceylon. Apply to File No. 3085-W.

CHEMICAL ENGINEER, Jr.E.I.C., B.Sc., Queen's '46, Professional Engineer (New Brunswick), age 26, married. Reliable and conscientious. Experience includes product control, piping layout and general engineering in Pulp and Paper and Petroleum Industry. Also held responsible position in sanitary engineering field as district engineer-in-charge. Desires responsible position in industry or with consulting engineer. Available immediately. Apply to File No. 3092-W.

PROFESSIONAL ELECTRICAL ENGINEER seeks position where expert knowledge of motor control gear, motors, switchgear, cables, etc., is required. Wide experience in applications, field and makers tests, layout, specifications, purchase and installation of controls. Would consider engineer-representation of reputable firms. Apply to File No. 3095-W.

STUDENT in 4th year Civil Engineering U. of T., S.E.I.C., graduating this spring, desires a position with an engineering consulting firm doing design or research work in steel, reinforced concrete, or timber structures. 28 years of age, R.C.A.F. veteran, married, onc child. Apply to File No. 3096-W.

LIBRARY NOTES

Additions to the Institute Library
Reviews—Book Notes—Abstracts

BOOK REVIEWS

CITIES OF LATIN AMERICA; HOUSING AND PLANNING TO THE SOUTH:

Francis Violich. New York, Reinhold, 1944. 241 p., illus., 9½ x 6¼ in., cloth, $3.75.

This book is a study of housing conditions, architectural development, and city planning in Latin America. It is based on material collected by the author during a survey of urban problems and plans in ten Latin American countries. The subject is an interesting and little-known one, and the author's treatment of it is highly readable and entertaining.

There is a great deal being done in Latin America towards city planning, but the movement as a whole is still in its infancy. Most planning offices operate as technical planning staffs under direct control of the government. Latin Americans excel in the planning of streets, parks, and public buildings. Their architecture is in the European tradition, but a beginning has been made in modern functional design.

General lack of education among the people is the chief cause of many social problems, and hinders the planning and housing programme. Two-thirds of the people are ill-housed, and many live in appalling slums. However, many technicians are interested and are working hard to improve conditions.

Much of the book is devoted to a contrast between Latin America and the United States, and the author finds that though Latin America is backward in comparison, the city planners are more versatile and less specialized, and work harder and more earnestly.

The book has been written with enthusiasm and vigour, and contains much information on the life and customs of Latin Americans as well as on city planning. It is well illustrated with photographs and attractively printed. L.S.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Aerial Photography in Urban Planning and Research:
Melville C. Branch, Jr. Cambridge, Harvard University Press; Toronto, S. J. Reginald Saunders. 1948. 150 p., illus., paper. (Harvard City Planning Studies No. 16).

Applied Mathematics for Engineers and Scientists:
S. A. Schelkunoff. New York, Toronto, London; Van Nostrand, 1948. 472 p., illus., cloth.

Civil Engineering for the Clerk of Works:
V. C. Whiting and K. Mills. London, New York, Toronto; Longmans Green, 1948. 152 p., illus., cloth.

Electromechanical Transducers and Wave Filters, 2d ed.:
Warren P. Mason. New York, Toronto, London; Van Nostrand, 1948. 419 p., illus., cloth.

Examination and Valuation of Mineral Property, 3d ed:
R. D. Parks, W. L. Whitehead and F. G. Pardee. Cambridge, Mass., Addison-Wesley, 1949. 504 p., illus., fabrikoid.

Field Engineering; a Handbook of the Theory and Practice of Railway Surveying, Location, and Construction, Volumes I and II, 22d ed:
W. H. Searles and H. C. Ives, edited by Philip Kissam. New York, Wiley; London, Chapman and Hall, 1949. 836 p., illus., fabrikoid.

Fuel and the Future; the Proceedings of a Conference held in London on October 8th, 9th and 10th, 1946, under the Auspices of the Fuel Efficiency Committee:
Ministry of Fuel and Power. London, HMSO, 1948. 3 vols., illus., paper.

Handbook of Culvert and Drainage Practice, for the Solution of Surface and Subsurface Drainage Problems, rev. ed:
Armco Drainage and Metal Products of Canada Ltd., Guelph, Ont., 1947. 510 p., illus., fabrikoid.

Handbook of Refrigerating Engineering, 3d ed:
W. R. Woolrich and L. H. Bartlett. New York, Toronto, London; Van Nostrand, 1948. 730 p., illus., cloth.

High-Polymer Physics; a Symposium:
Howard A. Robinson, editor. Brooklyn, N.Y., Chemical Publishing Co., 1948. 572 p., illus., cloth.

Installation and Servicing of Low Power Public Address Systems:
John F. Rider. New York, John F. Rider, Publisher, 1948. 204 p., illus., cloth.

Jet Propulsion in Commercial Air Transportation:
Robert E. Hage. Princeton, N.J., Princeton University Press, 1948. 91 p., illus., paper.

Logging; the Principles and Methods of Harvesting Timber in the United States and Canada:
N. C. Brown. New York, Wiley; London, Chapman and Hall, 1949. 418 p., illus., cloth.

Mathematics at Work:
Holbrook L. Horton. New York, Industrial Press; Brighton, England, Machinery Publishing Co., 1949. Illus., fabrikoid.

Metallic Corrosion Passivity and Protection:
U. R. Evans, with an appendix by A. B. Winterbottom. London, Arnold, 1948. 863 p., illus., cloth.

Motion and Time Study, 3d ed:
Ralph M. Barnes. New York, Wiley; London, Chapman and Hall, 1949. 559 p., illus., cloth.

Parking Lot Operation:
C. S. LeCraw, Jr. and W. S. Smith. Saugatuck, Conn., Eno Foundation for Highway Traffic Control, 1948. 114 p., illus., paper.

Practical Residential Wiring:
John F. Nowak. New York, Toronto, London; Van Nostrand, 1948. 495 p., illus., cloth.

Prestressed Concrete:
Gustave Magnel. London, Concrete Publications, 1948. 215 p., illus., cloth. (Concrete Series).

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

American Institute of Electrical Engineers:
Transactions, Volume 67, Part I, 1948.

LIBRARY REGULATIONS

Hours

	Oct.-May	June-Sept.
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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

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All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

Non-members may consult the library, but may not borrow material.

American Society for Engineering Education:

Proceedings, Volume 55, 1947-48.

British Engineers' Association:

Classified Handbook of Members ond their Manufactures, 19th ed., 1948.

Canadian Automobile Chamber of Commerce:

Facts and Figures of the Automobile Industry, 1948.

International Recognition of Rights in Aircraft:

Convention, Geneva, June 19th, 1948.

Portland Cement Association:

Cement and Concrete Reference Book. 1948.

Smithsonian Institution:

Annual Report of the Board of Regents, 1947.

TECHNICAL BULLETINS, ETC.

Harvard University. Graduate School of Engineering. Publications:

No. 448—Shipways with Cellular Wolls on o Marl Foundation, M. M. Fitz-Hugh, J. S. Miller, and Karl Terzaghi.—No. 449—Functions of Extended Class in the Theory of Functions of Several Complex Variables, Stefon Bergman.—No. 450—Studies on Leptospiro Icterohaemorrhagioe, IV. Survival in Water and Sewage: Destruction in Water by Halogen Compounds, Synthetic Detergents, and Heot, S. L. Chang, M. Buckingham, and M. P. Taylor.—No. 451—Kernel Functions in the Theory of Partial Differential Equations of Elliptic Type, S. Bergman and M. Schiffer.—No. 452—Mechanism of the Hydrolysis of Chlorine, J. C. Morris. —No. 453—On Bergman's Integration Method in Two-Dimensional Compressible Fluid Flow, R.V. Mises and M. Schiffer.—No. 454—Behavior of Chlorine as a Water Disinfectant, G. M. Fair, J. C. Morris, S. L. Chong, and others.

Ingeniors Vetenskaps Akademien. Handlingar:

Nr 200—Sorption in Flow through a Granular Layer, C. H. Johansson, G. Persson, and Borje Svensson.

Institute of Metals. Reprints:

Damping Capacity of Metals in Transverse Vibration, K. M. Entwistle.—Effect of Grain-Size on the Damping Capacity of Alpha Brass, K. M. Entwistle.—Measurement of Grain-Size of Tungsten and Tungsten Carbide Powders used for the Manufacture of Hard-Metal, H. Burden and A. Barker.

Institution of Electrical Engineers. Proof Sheets:

Fixed Resistors for use in Communication Equipment with Special Reference to "High-Stability" Resistors, P. R. Coursey.—Magnetic Amplifiers, A. G. Milnes. —Oscillogroph for the Automatic Recording of Disturbances on Electric Supply Systems, W. T. J. Atkins.—Polyphase Commutator Machines, B. Adkins, W. J. Gibbs.—Recurrent-Surge Oscillograph and its Application to the Study of Surge Phenomena in Transformers, E. L. White and W. Nethercot.—Theoretical and Experimental Study of the Series-Connected Magnetic Amplifier, H. M. Gale and P. D. Atkinson.

Institution of Mechanical Engineers. Advance Copies:

Cinematography in Engineering, H. A.V. Bulleid.—Control of Production, S. W. Lister.—Further Researches in Fluid Flow through Beds of Granular Material, H. E. Rose and A. M. A. Rizk.—Lubrication of Engines in Public Service Vehicles, A. T. Wilford.

International Civil Aviation Organization. Publications:

Circular 7—AN/6—Engineering Study of Factors Affecting the Choice of Frequencies of DME.—Circular 8—AN/7—South Pacific Region; Status of Implementation of Recommendations of First South Pacific Regional Air Navigation Meeting.—Index of ICAO Documents, Volume 1, Volume 2, Parts 1, 2 and 3.

Kungl. Tekniska Hogskolans. Handlingar:

Nr 19—Thermal Ageing Properties of Cellulose Insulation Materials, G. Malmlow.—Nr 23—Impedance Measurements in Decimetre Wave Band, B. Josephson. Nr 24—Model Tests on Single-Step Planing Surfaces; Publication No. 1/1947 of the Ship Testing Laboratory, C. Falkemo and J. Adlercreutz.

North-East Coast Institution of Engineers and Shipbuilders. Advance Copies:

British Marine Gas Turbines, T. W. F. Brown.

Princeton University. Industrial Relations Section. Selected References:

No. 25—Recent Trends in Industrial Pension Plans.

Purdue University. Engineering Extension Dept. Extension Series:

No. 66—Proceedings of the Thirty-fourth Annual Road School, held at Purdue University, February 2-5, 1948.

Svenska Forskningsinstitutet for Cement och Betong. Meddelanden:

N:r 13—Investigation on Formation of Cracks in Reinforced Concrete Structure, G. Wastlund and P. O. Jonsson.—N:r 14 Differential Equation for Calculation of Vibrations Produced in Load-Bearing Structures by Moving Loads, S.T.A. Odman.—N:r 15—Effect of Dynamic Forces on Structures, Erik Forslind.

U.S. Highway Research Board:

Current Road Problems No. 9-2R—Recommended Practice for Snow Removal and Treatment of Icy Pavements.

. . . Releases—*Study of Heavy Motor Vehicle Performance.*

. . . Research Reports *No. 1 D, 1948 Supplement — Survey of Pumping in Illinois.*

STANDARDS, SPECIFICATIONS, ETC.

Canadian Standards Association. Specifications:

CSA C15(E)—1948—Specification for the Physical Properties and Preservotive Treatment of Douglas Fir Poles.

PAMPHLETS, ETC.

Directory of Engineering Data Sources: a Guide to American Literature in Engineering and Related Sciences:

Southeastern Research Institute, Inc., Atlanta, Ga., 1948.

Lost Dimension or the True Principle of Relativity:

Jomes Bain. Buenos Aires, Castro y Cia, 1946.

National Aspects of Oil Development: Address before Canadian Club:

H. H. Hewetson. 1948.

Practical Application of Standard Costs:

F. R. Goodey. Manchester, Emmott, 1948. (Mechonical World Monographs No. 43).

Water Resources; Text of Address Prepared for 5th Semi-Annual Meeting of Graduate Engineers in Training. Shawinigan Falls. November 23, 1948:

H. M. Finlayson.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

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CANADIAN STANDARDS ASSOCIATION. STANDARDS:

B97—1948—Limits and Fits for Engineering and Manufacturing. 50c. Ottawa, the Association, 1948.

This standard gives definitions of terms applying to fits between plain (non-threaded) parts, outlines the procedure for specifying such fits, including the choice of the basic size of the parts and their tolerances; the allowance of the fit; the use of the basic hole system or the basic shaft system and preferred fits for general engineering purposes. It applies particularly to fits between cylindrical parts, but may also be applied to fits between mating parts other than cylindrical.

ELECTRICITY; TEXT BOOK AND LABORATORY MANUAL:

M. M. Das. New York, Toronto, Van Nostrand, 1948. 483 p., illus., 8¾ x 5¾ in., cloth, $5.50 (in Canada.)

This book is based on a course of lectures and laboratory work given to students preparing for the Intermediate examinations in Science and Engineering of the University of London. Theory and experiment run parallel, and a large number of experiments have been included. Recent applications of electricity, such as Magnetic Prospecting, Discharge Tube Lighting, etc., are dealt with, as well as fundamentals. Questions and exercises follow each chapter.

HEAT CONVECTION FROM FINNED TUBES:

E. Horrison. Monchester, Emmott, 1948. 43 p., illus., 6½ x 4 in., paper, 2/6-. (Mechanicol World Monographs No. 46).

This Monograph is an attempt to correlate the literature of the film rate of heat transfer on the extended surface side of heaters. For simplicity it has been confined to the common case of air or other diatomic gas as the medium to or from which heat is transferred, though the extension to other fluids is not difficult.

LANCASHIRE BOILER AND ECONOMISER DEFECTS AND REPAIRS:

Sydney D. Scorer. London, John D.

Troup, 1948. 38 p., illus., 9 x 6 in., paper, 6 –.

This pamphlet discusses the various kinds of failures and defects in boilers, and approved methods for dealing with them. It includes a classified summary of defects recorded in vertical cross-tube, Lancashires and Cornish boilers, and furnace tables for rapid calculation of safe working pressure.

MANUAL OF REPORT PREPARATION, CORRESPONDENCE AND TECHNICAL WRITING:

Frank Kerekes and Robley Winfrey. Dubuque, Iowa, Wm. C. Brown Co., 1948. 397 p., illus., 11 x 9 in., paper, $6.00.

This manual on the preparation of reports is meant for the student as well as the man in business, industry, or science. It offers material and suggestions for the improvement of report preparation. Much of the usual academic treatment of English and composition is omitted. Stress is placed on the preparation of the typescript, handmade reports, and the original form of all reports. Emphasis is upon the complete process of "preparation", rather than only upon the "writing" of reports.

MODERN MECHANICAL SAW PRACTICE:

J. Raymond Foyster. London, Crosby Lockwood, 1947. 274 p., illus., 8½ x 5½ in., cloth.

The writing of this book is an endeavour to expound the latest knowledge of saws and sawing technique in a constructive and organized manner, so that it may contribute to the industry wherever saws are used. In propounding technique, controversial subjects have been extensively discussed. The book is intended for sawyers and saw-doctors, owners of machines, saw manufacturers, designers and machine manufacturers, and research workers.

POCKET-BOOK FOR MECHANICAL ENGINEERS, new ed:

D. A. Low, edited by B. B. Low. New York, London, Toronto; Longmans, Green, 1948. 778 p., illus., 6 x 4 in., fabrikoid, $4.50 (in Canada).

The author has compressed into one volume a great deal of detailed information needed for ready reference by the mechanical engineer. Tables and diagrams are included in abundance in all sections. There is a long introduction dealing with mathematics in all its branches. A section on mechanics leads to the discussion of materials, their properties, and their products. The greater part of the book is devoted to machinery and its parts.

RESEARCH IN INDUSTRY; ITS ORGANIZATION AND MANAGEMENT:

C. C. Furnas, editor; prepared by and published for Industrial Research Institute, Inc. New York, Toronto, London; Van Nostrand, 1948. 574 p., illus., 9¼ x 6¼ in., cloth, $8.00 (in Canada).

This book presents principles and experiences that have proved applicable and valuable in the organization and management of industrial research. Some of the subjects discussed are the research director's job; the research budget; qualifications of research personnel; professional growth of the research man; the location, design, and construction of a modern research laboratory; translating research results into new products and factory procedures. Extensive bibliographies are included.

TELEVISION; HOW IT WORKS:

John F. Rider Publishing Co., New York, 1948. 203 p., illus., 11 x 8½ in., paper, $2.70.

This is a text intended for the television technician and the service industry. It incorporates the theoretical principles upon which the various circuits of a television receiver are based and also explanations of the operation of television receivers such as are on today's market. Numerous illustrations and explanatory diagrams are included.

TRAFFIC ENGINEERING FUNCTIONS AND ADMINISTRATION:

Joint Committee of the American Association of State Highway Officials, American Public Works Association, and the Institute of Traffic Engineers. Chicago, Public Administration Service, 1948. 137 p., illus., 10½ x 7¾ in., paper, $2.50. (Public Administration Service Publication No. 100).

The three groups forming the committee to deal with the traffic problem in the United States published this report as a survey of the situation and a recommendation of the means to be applied and the organizational structure required in the most effective attack upon the problem. It includes a detailed discussion covering the various aspects of traffic engineering, as well as many charts, tables, and illustrations.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

DESIGN OF CRYSTAL VIBRATING SYSTEMS FOR PROJECTORS AND OTHER APPLICATIONS:

W. J. Fry, J. M. Taylor and B. W. Henvis. Dover Publications, New York, 1948. 182 p., diagrs., charts, tables, 9½ x 6 in., cloth $3.50.

A detailed study is presented of crystal vibrating systems and procedures for their design involving graphs based on fundamental piezoelectric relations. While the graphs are prepared primarily for the design of projectors, they are equally useful in the design of other piezoelectric devices. Part I contains the design curves and detailed explanations of their use. Part II deals with the mathematical analysis and the derivations of the expressions used in constructing the curves. Appendices A and B provide units, definitions, symbols, conventions, and tables and graphs of physical constants.

DIESEL ENGINE DESIGN, 5th ed:

E. F. P. Purday. Constable & Company, Ltd., London, 1948. 545 p., diagrs., charts, tables, 6¾ x 5½ in., cloth, 25s.

The fifth edition of this text has been generally revised, parts rewritten, and many figures replaced with new illustrations typical of later practice. A new chapter has been added, which reviews the main problems of design and shows that the performance of a typical modern Diesel engine can be closely accounted for by known physical principles. The place of the Diesel engine with respect to other internal combustion engines is also considered, with special reference to the recent development of the gas turbine.

ENGINEERING CONTRACTS AND SPECIFICATIONS, 2d ed:

R. W. Abbett. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London, 1948. 327 p., charts, 8½ x 5½ in., cloth, $3.75.

The purpose of this book is to present some of the legal and business aspects of the engineering profession. In contrast to the first edition, increased emphasis is placed upon contract procedure for private work, although the original material on government methods has been retained and brought up to date. An entirely new chapter on construction insurance has been added, and the sections on prequalification and arbitration have been rewritten and expanded. Much new material on specification writing has been added.

FAN ENGINEERING, AN ENGINEER'S HANDBOOK, 5th ed:

R. D. Madison, editor, Buffalo Forge Company, Buffalo, 1948. 808 p., illus., diagrs., charts, tables, 7 x 4½ in., cloth, $6.00.

The four major parts of this useful manual deal respectively with: the physics of air; fan characteristics, dynamics, testing, etc.; fan applications; fans and air conditioning equipment. Theoretical principles and descriptive material have been condensed in order to include as much engineering data as possible. The book has been revised throughout to conform to current practice, and a more complete ready reference index to charts and tables is provided.

INTRODUCTION TO APPLIED MATHEMATICS.

F. D. Murnaghan. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 389 p., diagrs., tables, 9¼ x 5¾ in., $5.00.

Designed for graduate students and scientific workers with diversified interest, this book is a detailed and self-contained study of the mathematics used in modern physics and engineering. A methodical account is given of vector and matrix calculus, harmonic analysis, spherical harmonics, and Bessel functions. Also discussed are boundary value problems and integral equations, mechanical problems by means of the calculus of variations, and operational calculus.

INTRODUCTION TO HIGHWAY ENGINEERING, 5th ed:

J. H. Bateman. John Wiley & Sons, New York; Chapman & Hall, Limited, London, 1948. 538 p., illus., diagrs., charts, maps, tables, 9¼ x 5¾ in., cloth, $5.50.

In addition to fundamentals this comprehensive text includes practical examples and problems. In the revised edition material has been added on highway traffic surveys, soil-cement and bituminous-soil base courses, concrete mixtures, and the use of air-entraining cement or air-entraining admixtures. The material on highway subgrade soils has been reworked.

U.S. HIGHWAY RESEARCH BOARD, PROCEEDINGS OF THE TWENTY-SEVENTH ANNUAL MEETING, HELD AT WASHINGTON, D.C., Dec. 2-5, 1947.

R. W. Crum and others, editors. National Research Council, 2101 Constitution Ave., Washington, D.C., 1948. 523 p., illus., diagrs., charts, tables, 9¾ x 6½ in., cloth, $7.50.

Some forty-five papers and reports are contained in the present volume of this annual publication. They are grouped under six broad headings: economics, finance and administration; design; materials and construction; maintenance; traffic and operations; soils investigations. Information on the work of the various committees and on certain awards is also given.

PUBLIC HEALTH ENGINEERING, Vol. I.

E. B. Phelps and others. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 655 p., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $7.50.

Written primarily for municipal and civil engineers who want to know what to design and build and why, this book covers the entire field of environmental sanitation. Its approach is through chemistry and the biological sciences. Divided into two parts: a discussion of the air contact, broadly defined to include atmosphere pollution from smoke, odors and noise, ventilation, illumination and insect problems; and a discussion of water contact, including the uses and abuses of water resources, stream sanitation, sewage treatment and conservation of water supplies. Food will be dealt with in volume 2, to be published later.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

HEAT ENGINES, 3d ed:

S. H. Moorfield and H. H. Winstanley. Edward Arnold & Co., London; Longmans, Green and Co., New York, Toronto, 1947. 326 p., illus., diagrs., charts, tables, 7½ x 5 in., stiff cardboard, $2.25.

Containing fundamental principles, this book is intended for use as a text for a year course in heat engines. In this third edition, the Fahrenheit temperature system is used in all steam calculations and data. Other portions of the text have been rewritten and new examples included. A background of elementary physics is needed.

INDUSTRIAL ELECTRIC FURNACES AND APPLIANCES, Volume II.

V. Paschkis. Interscience Publishers, Inc., New York and London, 1948. 320 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.00.

This book covers resistance furnaces and appliances, induction and high-frequency capacitance heating, and the selection of furnaces. A fairly rigid classification of furnaces is made and applications for each general class are listed. The electrical fundamentals of induction and capacitance heating are discussed only briefly, and no attempt is made to cover specific technologies such as drying and quenching. Volume I presented an introductory survey and covered electrode melting furnaces.

MECHANICS, 2d ed:

J. W. Breneman. McGraw-Hill Book Company, New York, Toronto, London, 1948. 144 p., diagrs., tables, 9¼ x 6 in., cloth, $2.50.

A simplified presentation of the fundamentals of mechanics, this volume is intended for students with a limited mathematical background. Stress is laid on the application of principles to important practical problems common to industry. In addition to conventional topics, there is a complete study of levers, pulleys, gears and gear trains and mechanisms. In this new edition, the material has undergone considerable revision, and a large number of problems has been added.

PRODUCTION CONTROL, 2d ed:

L. L. Bethel, W. L. Tann, F. S. Atwater and E. E. Rung. McGraw-Hill Book Co., New York, Toronto, London, 1948. 289 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50.

Originally developed for use by war production workers, this book has been rewritten in terms of current practice to meet the needs of a collegiate programme in management engineering. The general method of presentation is: statement of the basic principles; illustration of the principles through application to specific industrial situations; and case problems to which the student applies the principles involved. Elementary phases of industrial organization and management are omitted. A bibliography is included.

SOLID AND LAMINATED WOOD BENDING.

W. C. Stevens and N. Turner. Department of Scientific and Industrial Research; His Majesty's Stationery Office, York House, Kingsway, London, W.C.2, 1948. 71 p., illus., diagrs., charts, tables, 9¾ x 6 in., cloth, 5s.

The book describes the various necessary equipment and processes for effective wood bending. It is largely a handbook of practice, but contains sufficient theoretical background to explain the adopting of the various procedures. Glue setting methods are covered in the laminated bending section.

STANDARDS OF HYDRAULIC INSTITUTE, 8th ed., 1947.

Hydraulic Institute, 20 West Street, New York 6, paged separately, illus., diagrs., charts, tables, 11¼ x 8¾ in., paper, $3.00.

Of value to purchasers and users of pumps as well as to pump manufacturers, this volume contains pertinent technical and engineering pump data. There are sections on centrifugal, rotary and reciprocating pumps, on miscellaneous data, and over 80 pages on pipe friction.

TABLES FOR THE DESIGN OF MISSILES.

Harvard University Press, Cambridge, Mass., 1948. 226 p., diagrs., tables, 10¾ x 7¾ in., cloth, $9.00. (Annals of the Computation Laboratory of Harvard University, Vol. XVII.).

These tables were made to facilitate the design of missiles by permitting rapid calculation of the characteristics of the quantities affecting the behaviour of a missile in flight. In the introduction, definitions of the tabulated functions, the method of computation, interpolation instructions, the use of the tables, and nonstandard ogives are considered. The major portion of the book contains complete tables of important functions with sufficiently small increments for precise work.

TECHNICAL DRAWING PROBLEMS, Series 2.

H. C. Spencer and H. E. Grant. Macmillan Company, New York, 1948. no pagination, illus., diagrs., charts, tables, 11 x 9½ in., paper, $4.25.

Using for the most part completion-type problems, this workbook presents a wide variety selected from current industrial practice. A "work plan" section contains specific instructions for solving all the problems given, together with references to the companion text: "Technical drawing," by Giesecke, Mitchell and Spencer, the second edition, 1940. Technical lettering and freehand technical sketching are covered as well as the customary drawing-board work.

BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

Appointments and Transfers

Arthur H. Frampton has been appointed general manager of the English Electric Company of Canada, Limited. He will be located at the head office of the Company in St. Catharines, Ont. A graduate engineer, Mr. Frampton has been associated with the Canadian electrical industry for the past thirty years. Before joining English Electric, he was deputy assistant general manager—engineering, of the Hydro Electric Power Commission of Ontario.

As a Hydro executive, Mr. Frampton assumed major responsibilities in connection with the direction of the Commission's post-war expansion programme. He is president of the Engineering Alumni Association and is also actively identified with the Alumni Association of the University of Toronto.

G. Frank Simpson

G. Frank Simpson has succeeded his father, Guy H. Simpson as manager of the Quebec City branch of Crane Limited. Following graduation in Arts from McGill University in May 1928, he joined the Crane Company and has held positions in the Purchasing Department, Order Department, the Montreal Showroom, and as Advertising supervisor.

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Roy H. Sjoberg is now assistant general manager, Automotive Division of the Canadian Car & Foundry Co. Ltd. He is located in the head office of the Company in Montreal.

A. K. Tate

A. K. Tate has been appointed general sales manager of the Car Division of the Canadian Car and Foundry Co. Ltd. Mr. Tate joined the Company in 1916 on his return from active service overseas. During World War II Mr. Tate was his Company's representative in Washington.

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A. G. Robertson has succeeded the late F. C. Ransom as superintendent of the Refining Department of the Consolidated Mining and Smelting Co. of Canada Ltd. Mr. Robertson graduated in 1935 from the University of Alberta with a B.Sc. in mining engineering. He is vice-chairman of the West Kootenay branch of The Canadian Institute of Mining and Metallurgy.

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The Northern Electric Co. Ltd., has made four senior appointments in the Wire and Cable Division. Effective January 1, R. G. Harries, formerly shop superintendent, was appointed works superintendent of the Division's Shearer Street plant in Montreal. A. M. Croll is now works superintendent of the Lachine plant.

G. K. Reynolds, formerly acting Lachine plant superintendent, was appointed personnel superintendent of the Division and E. D. Bent has been named chief engineer.

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It was announced in the New Year's R.C.N. promotion list that Commodore (E) John G. Knowlton, chief of Canadian Naval Technical Services, has been promoted to the rank of Engineer Rear Admiral.

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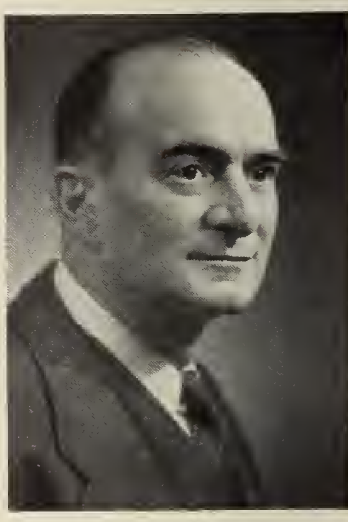
C. L. Farquhar has been appointed manager of the Gananoque forging plant of the Steel Company of Canada Ltd. Mr. Farquhar has spent his entire professional career with the Company.



J. L. T. Martin

J. L. T. Martin has been appointed secretary of the Shawinigan Water and Power Company and Matthew Balls, M.E.I.C., has been appointed assistant vice-president of the Company.

Mr. Martin succeeds H. G. Budden who is retiring under the Company's pension plan. Mr. Balls will continue to direct operations of the water resources department of which he has been manager since 1941.

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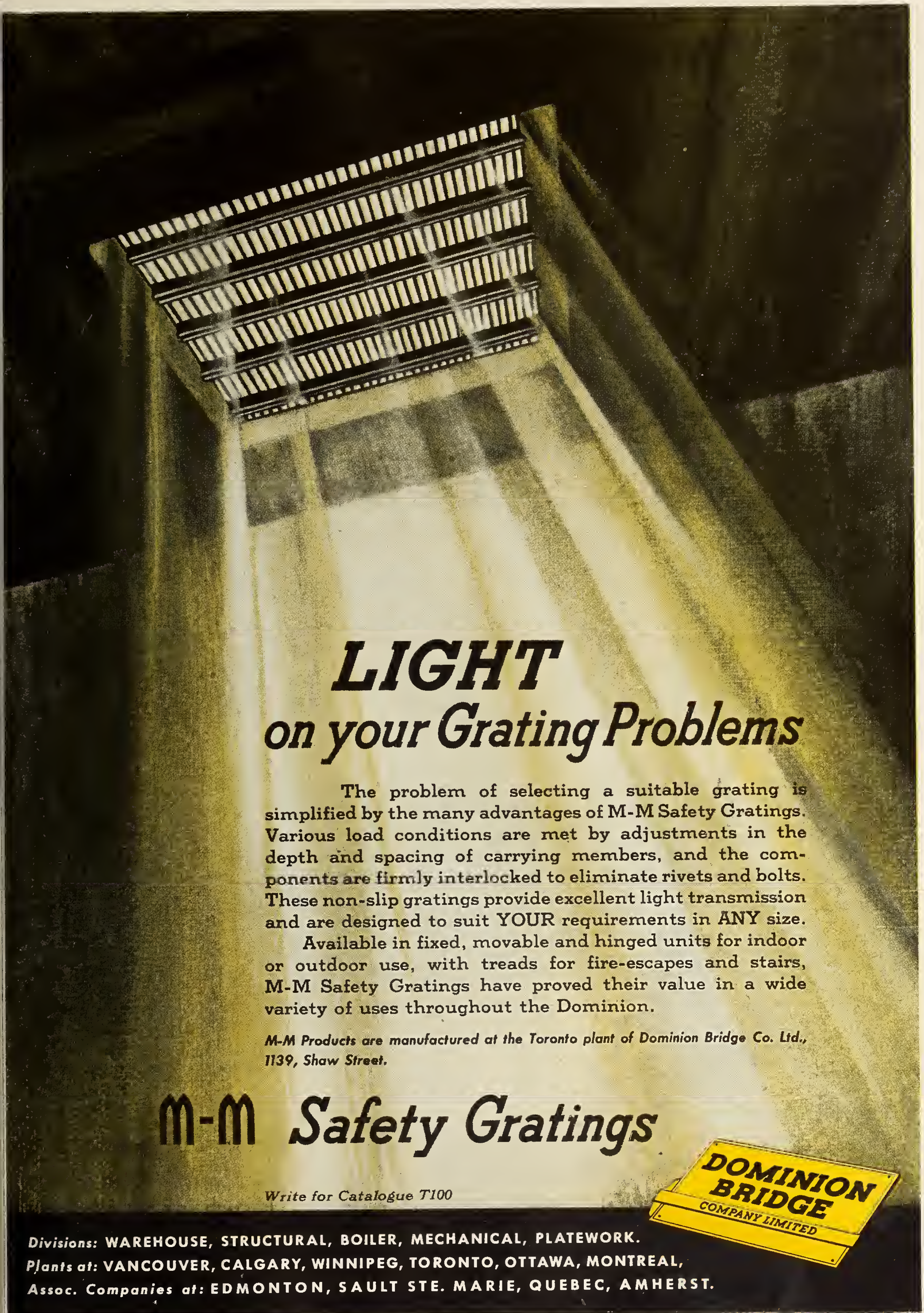
M. C. Lowe is now vice-president in charge of operations and R. K. Carty is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secretary-treasurer of Canadian Allis-Chalmers Ltd. Mr. Lowe and Mr. Carty are directors of the Company.

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J. C. Alexander has been appointed general sales manager, Mechanical Goods Division, Dominion Rubber Co. Ltd., Montreal. He joined the Company in 1936. After considerable experience as a sales engineer covering the mining, pulp and paper, and industrial accounts in the Company's Western Division, he was transferred in 1940 to the Toronto office as assistant sales manager of mechanical goods. In 1942 he was appointed executive assistant, War Products division at the Company's head office in Montreal and was later named as assistant general sales manager of the Mechanical Goods Division in which capacity he served up to the time of his present appointment.

H. T. Williams

H. T. Williams has been appointed general sales manager and O. E. Loberg assistant general sales manager of the Gurney Foundry Co. Ltd. In addition to his duties as general sales manager, Mr. Williams will continue to direct the sales of the Heating Division, while Mr. Loberg will supervise the sales of the Stove Division.

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Dr. Gerard Herzberg was appointed, on January 1st, director of the Division of Physics of the National Research Council. Dr. Leslie E. Howlett has been appointed associate director of the Division of Physics of the Council.

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D. D. C. McGeachy has been appointed president and general manager of the Canada Vulcanizer and Equipment Company Ltd., of London, Ontario. Mr. McGeachy has been affiliated with the Company as vice-president and general manager for the past year.

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The Northern Electric Co. Ltd., has announced that Martin P. Murphy and James S. Cameron, M.E.I.C., have been appointed vice-presidents of the Company. Mr. Murphy was formerly assistant general manager (commercial) and he will now serve as general manager reporting to the president. Mr. Cameron was formerly assistant general manager (manufacturing).

J. H. Salter has been appointed assistant manager of the Personnel Division of The Consolidated Mining and Smelting Company of Canada Ltd. Mr. Salter graduated from the University of Toronto in 1934 with a B.Sc. degree in metallurgy and he started permanent employment with the Company in the same year.

•

A. E. Dyment has been named sales manager of the explosives division of Canadian Industries Ltd., Montreal. Mr. Dyment is a University of Toronto graduate in mining engineering. He has been with C.I.L. since 1930.

•

Sam L. Mackay, president of Engineering & Machinery Ltd., 736 Granville Street, Vancouver, B.C., has acquired Gilbert H. Bancroft's shares in the Company. Mr. Bancroft has opened his own engineering office. (See "Personals", January Issue.)

•

A. C. McGiverin is now director of government sales for all divisions of the Dominion Rubber Co. Ltd., Montreal.

•

N. Bruce Wilson, president of The Automatic Clutch Corporation of Canada, announces the removal of the head office of the Company to 165 Spadina Avenue, Toronto. The change in location was brought about by the Company's expansion in business.

N. Bruce Wilson

A. B. Russell has been appointed assistant works manager of the Canadian Allis-Chalmers' plant at Lachine, Quebec.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

On advertising page 44 of this issue of the Journal is a half-page advertisement headed "Ex-Tuberculosis Patients Make First Class Employees" published under the authority of the Hon. Milton F. Gregg, V.C., minister of The Department of Veterans Affairs. The editor has received a copy of the booklet referred to in the advertisement and it is recommended as containing most informative material. Inquiries should be addressed to the Department of Veterans Affairs, Ottawa, Ontario, and the publication should be referred to by name "Employment of the Tuberculous".

•

South Bend Lathe Works, South Bend 22, Indiana, offers Catalogue No. 100-G. It is printed in four colours and contains illustrations and specifications of all major items manufactured by the Company. The street address of the manufacturer is 359 East Madison Street, South Bend 22, Indiana.

•

The Cleveland Worm and Gear Company, 3249 East Eightieth Street, Cleveland 4, Ohio, has available copies of an extremely interesting brochure entitled "More Horsepower per Dollar". Copies may be obtained from the manufacturer or through their Canadian agent, Peacock Brothers Limited, Ville Lasalle, Montreal, P.Q.

•

Armstrong Cork Canada Limited, P.O. Box 6092, Montreal, P.Q., has issued a twenty-four page two colour bulletin "Armstrong's Gasket and Sealing Materials". This publication is recommended to readers who wish to have available up-to-date information on the characteristics and uses of gaskets and sealing materials.

•

English Electric Company of Canada Limited of St. Catharines, Ontario, offers readers of the Journal a new booklet on type "AD" squirrel cage induction motors. The bulletin gives full specifications for this type of motor. The booklet measures 8½ x 11", contains 8 pages and is printed in two colours. Ask for bulletin No. 148-5.

•

The Gaertner Scientific Corporation, 1201 Wrightwood Avenue, Chicago 14, U.S.A., has authorized the distribution of a well-produced catalogue on Gaertner Microscopes for Laboratory and Shop. The publication is most informative and the material is presented in an excellent manner. Copies may be obtained from the manufacturer.

•

The Canadian Fairbanks-Morse Company offers bulletin G-182 covering American flexible metal hose for which the Company is the Canadian distributing agent.

•

The International Nickel Company of Canada Limited, 25 King St. West, Toronto, offers 4 interesting booklets.

These are "Controlling Corrosion on Petroleum Production Equipment"— which covers nickel alloy uses in the petroleum industry — "Corrosion by Concentration Cells" in which are suggested methods for minimizing or preventing concentration cell corrosion; a revised edition of "Helpful Publications of Nickel Alloys", in which are outlined the Company's materials which would be of interest to production men, design engineers, metallurgists, and other users of metal. The fourth booklet in the group is called "How to Cure Some Overhead Aches" and it is intended primarily for engineers in the brewing industry.

•

The Dominion Engineering Company Limited, P.O. Box 220, Montreal, will be pleased to add the name of readers of the Journal to the mailing list of the "Dominion Engineer," the Company's monthly publication which is now commencing its 16th volume. In the January, 1949 issue there is a description of manufacture of plywood and wallboard which provides most interesting reading.

•

The Miller Motor Company, 4027 N. Kedzie Avenue, Chicago 18, Illinois, offers an 8-page reprint of an article "Hydraulic Seals" which appeared in December "Machine Design." The article gives information on the advantages and disadvantages of the various types of hydraulic seals now in use and discusses recently developed methods of sealing.

•

The Nordberg Manufacturing Company, Milwaukee 7, Wisconsin, announces a new 10 horsepower Diesel engine. Known as the type 4FS-1 this new engine is a heavy duty, vertical type, four cycle, single cylinder, mechanical injection machine. It has 4½" bore and 5¼" stroke and is rated at 10 hp., 1200 r.p.m. and 15 hp. at 1800 r.p.m. For complete details ask the manufacturer for bulletin No. 165.

•

Information on the new D Roadster Tournapull, one-man operated, self-loading dirtmover, is contained in a new D Roadster literature Broadside, which may be obtained on application to the manufacturer, R. G. LeTourneau Inc., Peoria, Illinois.

New Equipment and Developments

Aiken & MacLachlan Limited of St. Catharines, Ontario, has been awarded the general contract for the construction of a dam and power house, Matthias Power Project, South Muskoka River, for the Orillia Water, Light and Power Commission. The dam will be 800 feet long and 30 feet high and the plant will develop 3000 hp.

•

According to information received from Hobbs Glass Limited, London, Ontario, "Herculite" plate glass is receiving wide acceptance. This product, which the manufacturer claims is much stronger than ordinary glass, will not break under normal usage. It will stand temperatures up to 500°F. It is also claimed that, should the glass be broken, the particles resemble rock salt and do not cut or lacerate.

The glass is recommended for use in revolving doors, inspection tables, oven door fronts and other places where there is exposure to heat or impact.

•

The 1949 Canadian International Trade Fair will be held at the Toronto Exhibition Grounds from May 30th to June 10th. One of the principal purposes of the Fair is to give business and professional men the opportunity to get together with their counterparts from every part of the world; to do business with them face to face, and to put the ingenuity and initiative of business and professional men to work in breaking down the barriers which impede present international trade.

The Trade Fair will be open to the public on two Wednesdays and one Saturday during the period of the Fair. On other days the attendance will be restricted to business and professional visitors. Twenty-one groupings of displays have been arranged and of particular interest to the professional engineer will be the Chemicals; Automotive; Marine and Aviation; Building Materials and Contracting Materials; Iron, Steel and Non-Ferrous Metals; Electrical Tools, Motors and Supplies; Engineering and Plant Equipment; Rail and Tramway Equipment and Supplies.

E. S. MacDonald Company, Montreal, is completing an order which calls for 25,000 five-gallon aluminum cans a week for a period of ten months. These cans are to be used for the transportation of acid from Montreal to a rubber plantation in the Malay States. The material being welded is type 57-SH aluminum, .032 in. thick. A welding speed of about 26 in. per minute is maintained, using 5 litres of argon gas per minute at approximately 60 amperes. Tungsten electrode, of 3/32" diameter, is used. Two CGE type WP Inert-Arc welders are being used for this job.

•

A new type of industrial truck to handle the largest packs of plate glass ever assembled has been designed and built by Elwell-Parker Electric Co., Cleveland, Ohio. The truck that has solved this problem is also recommended by the manufacturer for use in handling large sheets of other materials, such as steel, asbestos and building board. For details communicate with the manufacturer, 4205 St. Clair Ave., Cleveland 14, Ohio.

•

A two year research project aimed at checking and improving design procedures of shell roof structures has been assigned to the Fritz Engineering Laboratory of Lehigh University by the Roberts and Schaefer Engineering Co. of Chicago. Under the contract, experimental and analytical research will be conducted on the design of shell structures of reinforced concrete of the type used in large aeroplane hangars or in domes of monumental buildings. In such structures, spans of several hundred feet are bridged by shells only a few inches thick and stiffened by slender arch ribs.

•

A new portable pump unit has been announced by the Eco Engineering Company, 12 New York Avenue, Newark 1, New Jersey, manufacturers of Gearless Pumps. This new unit consists of an Eco Gearless Pump, Model PT-2, powered by a 1½ hp. single cylinder, four cycle air cooled gasoline engine. It is designed for use wherever a portable type emergency pump is required.

•

Etraco Manufacturing Co. Inc., Woods Church Road, Flemington, N.J., has announced a new portable safety transformer to safeguard workers in damp surroundings from the possibility of fatal electric shock while working with the conventional type of 110 volt extension lamp. It is particularly recommended for use in places where there is contact by hands, feet or body with grounded surfaces. The portable safety unit weighs only 4¼ pounds and reduces a 110 volt circuit to only 6 volts. Complete details may be obtained from the manuacturer.

•

The longest continuous lighting installation in the world, in which four ribbons of fluorescent light will extend almost two miles, has been designed for the Brooklyn-Battery tunnel by New York City engineers in collaboration with engineers of the General Electric Company. Each of the tunnel's two tubes will carry two lanes of traffic, and will be lighted by twin rows of white fluorescent lamps.

A total of 5,776 individual lamps will comprise the entire installation. The lamps will be housed in clear Pyrex "pipe" near the top of the sidewalls of the tubes.

Astronomical clocks will turn on a higher intensity of light in the portal sections of the tunnels during daylight hours.

•

R. G. LeTourneau Inc., of Peoria, Ill., has announced the addition of three new tools to its line of earthmoving and materials handling equipment—the E-35 Tournahopper, the E-40 Tournarocker and the E-25 Carryall Scraper. Complete details of the equipment may be obtained from the manufacturer.

•

The R.C.A. Victor Company Ltd., has completed what is believed to be the first installation in Canada of test equipment for use in the manufacture of television receivers.

•

Two 40-ton, four-axle, trolley-type, high-speed mine haulage locomotives have been delivered by General Electric's Locomotive and Car Equipment Divisions, Erie, Pennsylvania, to the Consolidated Mining and Smelting Co. of Canada Ltd. General Electric engineers said that these are the largest mine-type electrical locomotives ever built by the Company.

•

Canadian General Electric announces a compound recommended for lubricating rubber and lead covered cables as they are pulled through conduit. The compound contains no oils, greases, or other materials which may be injurious to wire and cable insulation. Complete details may be obtained from the Company.

•

Electric lighting costs will be reduced as a result of a fluorescent lamp improvement announced by General Electric Company. Consumers who have been employing 100 watt fluorescent lamps will use about 14% less electricity and still obtain the same amount of light, according to G.E. illuminating engineers.

The saving will be possible as a result of the development of an 85 watt fluorescent lamp which produces the same high light output, has the same long life and the same overall dimensions as a 100 watt lamp. This development is a result of the successful use of Krypton instead of Argon as the tube filling.

•

Vital Products Manufacturing Company announces new additions to its line of featherweight caulking guns and the redesign and improvement of standard models. These Caulking Guns are now supplied in seven sizes and types ranging from one pint to 2½ quarts capacity. For details apply to the manufacturer at 7500 Quincy Avenue, Cleveland 4, Ohio.

•

Installation of a chlorine cylinder-filling unit at the chemicals plant of Canadian Industries Limited in Cornwall is to be made at an approximate cost of $100,000, it was announced by the works manager, F. M. Robertson.

Work on the new unit, which was designed by C-I-L engineers, will start next spring and completion is expected by the fall. It will be housed in a new concrete brick and steel building.

•

Now in operation at the Northern Electric Company's Lachine Wire and Cable Plant are three new electric telephone cable dryers and two new Watson tripling machines. Several new impregnating tanks will be put into operation in a short time. A length of cable can be thoroughly dried within 80 to 90 minutes in one of the new driers. Before conversion to electricity this operation took from 6 to 8 hours in the case of loop cable and 24 to 30 hours when toll cable was being manufactured.

•

Industrial employment in Canada reached the highest known point during 1947. The general index for the eight major divisions were 8.5% higher than during the preceding year. Weekly payrolls rose 21.2%. The average wage and salary during the year was $36.15 per week as compared with $32.03 in 1946 — this represents a general increase of 11.6%.

•

According to the Canadian Metal Mining Association, mineral production in Canada during 1948 was over seven hundred and fifty million dollars in value. It is anticipated by the association that in the near future the value of mineral production will reach one billion dollars per year.

•

The Hydro-Electric Power Commission of Ontario is negotiating for the purchase of the Kaministiquia Power Company, according to a statement made by Robert H. Saunders. Commission chairman. The plant is located about twenty miles west of Fort William and has a rated capacity of 24,000 kilowatts. If the purchase is made the power developed

"Business & Industrial Briefs"

This section of the *Journal* is intended to keep readers informed on developments and changes in those business and industrial enterprises, and on new products, which affect the engineer.

If you write with respect to any of the items in this, or other sections, please mention

THE ENGINEERING JOURNAL

by the plant will be tied in with the Commission's Thunder Bay system or Northern Ontario property. The purchase would give the Commission control of the flow at the plant and also control over water storage facilities in the Kaministiquia River water shed.

•

The British Columbia Electric Railway is planning the construction of a 66-mile steel tar transmission line between Victoria and Nanaimo. The present arrangements call for completion by October 1950. The line will link up with the provincially owned British Columbia Power Commission Hart development at the Campbell River. Anticipated total cost of the project is about three million dollars.

•

H. B. Sherman, vice-president and general manager of the Calgary Power Limited has announced that plans have been completed to provide electricity for an additional 2,500 Alberta farms during 1949. About 2,000 miles of farm power lines will be built at an approximate cost of $1,800,000. Completion of the project will raise to over 6,500 the number of Alberta farms serviced by the company.

•

A scale model is being utilized by the Northern Electric Company for the rearrangement of the telephone division department on the ground floor of the Shearer Street plant in Montreal. The model, which measures approximately ten feet by five feet is marked off in squares, each square representing two square feet. Small scale models of all the equipment to be used in the plant have been made and miniature figures representing the personnel of the plant are included in the mock-up. The Company used a similar arrangement when planning the new wire and cable division plant at Lachine. It was found that the use of a model reduced planning costs and eliminated a great deal of preliminary drawing.

•

Canadians have been very prominent in the work being done by the International Civil Aviation organization. Brigadier C. S. Both, former secretary and legal advisor of Canadian Air Transport Board has succeeded Anson McKim as Canadian representative on the ICAO. Mr. McKim, is now vice-president of traffic for T.C.A. Pan Canada is taking steps to carry out its share of an ICAO sponsored agreement made with other North Atlantic countries. The work and duties to be performed by Canada under this agreement include the provision of thirteen weather observation stations, the correction and amplification of the aeronautical maps covering Canadian territory and their revision so that they will correspond with ICAO charts. As part of the same agreement a Canadian weather ship will be stationed on the Atlantic and a long range radar station will be operated.

•

According to Dr. Edward R. Weidlein, director of the Mellon Institute of Industrial Research, Pittsburgh, the vast coal resources of the United States should meet all requirements, for heat, light, power and transportation for more than one thousand years at the present rate of fuel consumption.

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"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

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CONTENTS

12,450 copies of this issue printed

COVER PICTURE

In response to many requests from readers, the *Journal* carries in this issue, a paper dealing with foreign engineering practice—in this case, achievements in Switzerland in the field of electric boilers.

As an indication of Canadian practice we have shown on the cover an electric boiler built by Dominion Engineering Works Ltd., for the Montreal plant of the Dominion Rubber Company. It is a 72-inch, single-tank, 8,000-kw., 2,200-volt unit equipped with surge tank control.

Photo courtesy Dominion Engineering Works, Ltd.

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Counterweight Replacement on the Cherry Street Bascule Bridge

by

E. R. Graydon, M.E.I.C.

Engineer, Ontario Division, Dominion Bridge Company Limited, Toronto, Ont.

A paper prepared for publication in The Engineering Journal

Failures in the structural steel framework of counterweights for bascule bridges have been quite frequent. Theories as to the causes have been various and non-conclusive. The author presents a simple and plausible theory that serves a useful purpose. Describing the failure in detail and the method of repairs adopted, he analyses the design and gives his conclusions as to how such a failure may be avoided.

The North Cherry Street Bascule Bridge is a Strauss trunnion bascule structure over Keating's Channel on Cherry Street, in Toronto. It is a 130-foot span carrying a 42-foot roadway and sidewalks. Figure No. 1 shows a design diagram. It was erected in 1917, and hence, in the spring of 1947, had been in service for some thirty years. It had been erected in the open position, and the counterweights were believed to have been supported on piles during pouring.

The condition of the counterweights had been of concern to the owners of the bridge, The Toronto Harbour Commission, for some time. In an attempt to halt the severe weathering action occurring on the counterweights, a covering of light gauge metal plates had been placed on the surface of the counterweights in 1936.

In the spring of 1947, the Toronto Harbour Commission decided to remove the plate covers and investigate the condition of the counterweights. Removal of some of these plates revealed that deterioration had not been halted, but that large areas of the concrete surface were in poor condition. In general the entire surface was cracked, with many of these cracks extending over a foot below the surface, while the quality of the surface concrete had deteriorated to the extent that it could be flaked off or crumbled at ease. Upon discovery of this condition, the owners decided upon replacement of the concrete.

How Counterweights Were Repaired

The original counterweights had been composed of a concrete mix containing iron ore aggregate, and weighing 176 pounds per cubic foot. It was decided to replace the counterweight with a mix of the same weight per cubic foot, but using steel punchings to attain the required unit weight. As work was to be done in the navigation season, it was necessary to tie the bridge back in the open position. The leaf tie-backs were composed of two sets of 12 parts of ¾-inch wire rope. They were connected to the bridge trusses at the junction of the top chord and the sloping end posts, and were connected to anchorage pads located an average of 130 feet back from the trunnion pin. These anchorages were located in filled ground, and were composed of concrete pads, 5 ft. by 8 ft. by 12 ft. 6 in., poured around several vertical and batter piles. With the leaf up, the tie-back cables were installed and tightened up on wood blocking until the bumper springs reached the desired compression.

Removal of the counterweights was then commenced, working on both counterweights at about the same rate. The extent of the deterioration of the concrete was soon verified. Adjusting blocks in the pockets were found to have completely crumbled. Despite the condition of the exterior portion of the counterweights; a good deal of the interior concrete around the steelwork was in good condition, and was very difficult to remove. Examination of the concrete aggregate indicated that some gravel had been used for the coarse aggregate, and that the iron ore, used to attain the required weight per cubic foot, had varied in size from ¼ inch to 3 inch material. As removal of the concrete progressed, an additional source of trouble was revealed. A complete break was discovered in one of the counterweight truss members on the West side. Four additional breaks in the steel were discovered. With the counterweight trusses completely bare of concrete, a careful inspection was carried out, but no further cracks were discovered in the

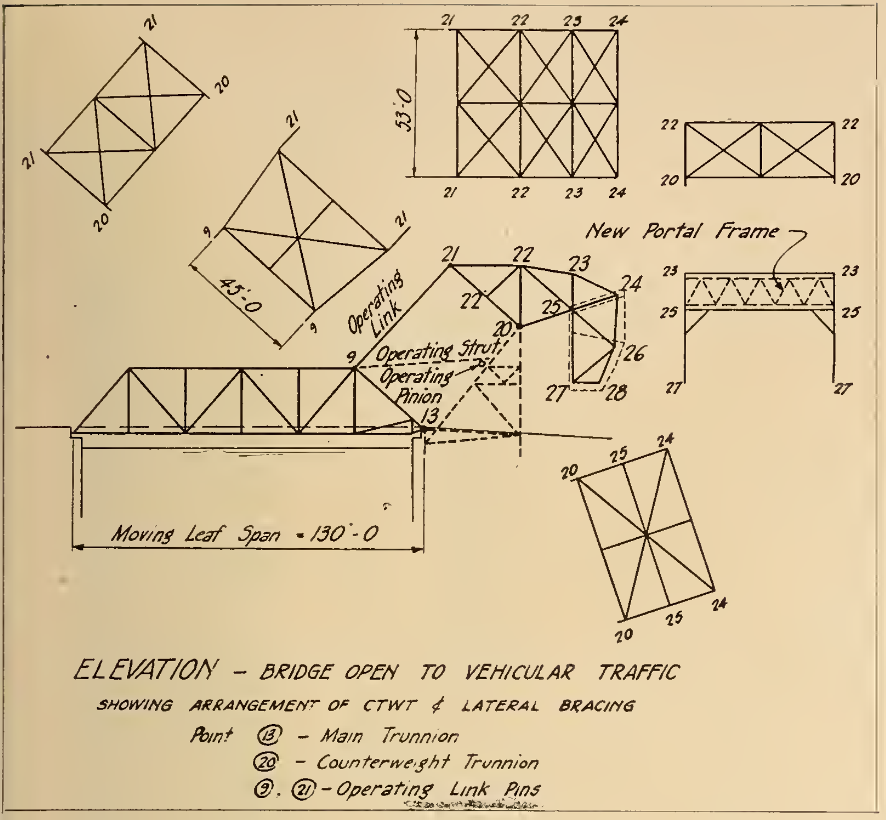


Fig. 1.

steelwork. Considerable corrosion had occurred, however, in the areas where the steel emerged from the concrete, and, in some cases, inside the counterweight where the steelwork had apparently not been in good contact with the concrete.

All of the breaks were spliced, and, after verification of the depth of corrosion by sand-blasting, the corroded areas were reinforced. The counterweights were then formed, and placed in one continuous pour, the forms being supported during the pouring, on piles driven before the bridge was tied back. Each counterweight required about 145 yards. The concrete mix had to be adjusted to allow for the steel added in splicing the fractured members, and the final unit weight of concrete was 172.7 pounds per cubic foot. This weight was attained by using a mix containing steel slugs. These slugs were steel punchings $\frac{3}{4}$ in. to $1\frac{1}{4}$ in. in diameter, and $\frac{1}{4}$ in. to 1 in. in thickness. The mix was designed to give 3,000 pound concrete, and the quantities for 1 cubic yard are shown below:—

Quantities per 1 Cubic Yard

Cement	570 lb.
Sand (dry)	1,280 "
Gravel (dry)	1,750 "
Steel Slugs	760 "
Water (total)	31 gal.

Tests were made of this mix before and during pouring, and the desired unit weight was closely adhered to. On removal of the forms, the bridge was balanced by the addition of adjusting blocks, poured to the same mix as the counterweights and, after testing, put back into service.

Where Failure Occurred

The whole operation may be of some interest, but the writer's main point in recording it was to call attention to the structural failure of the counterweight truss members, and to theorize on that failure. The failures discovered in the steel members of the counterweight trusses were as follows, and, in this description, the writer again refers the reader to Figure No. 1 for the location of the breaks:—

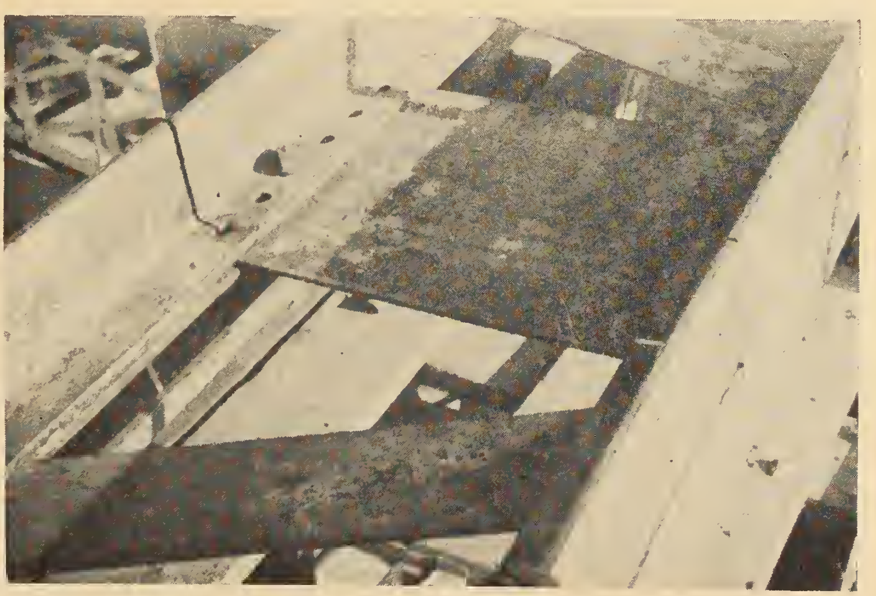
"(1). Member 25-27; West counterweight truss only; member completely fractured."

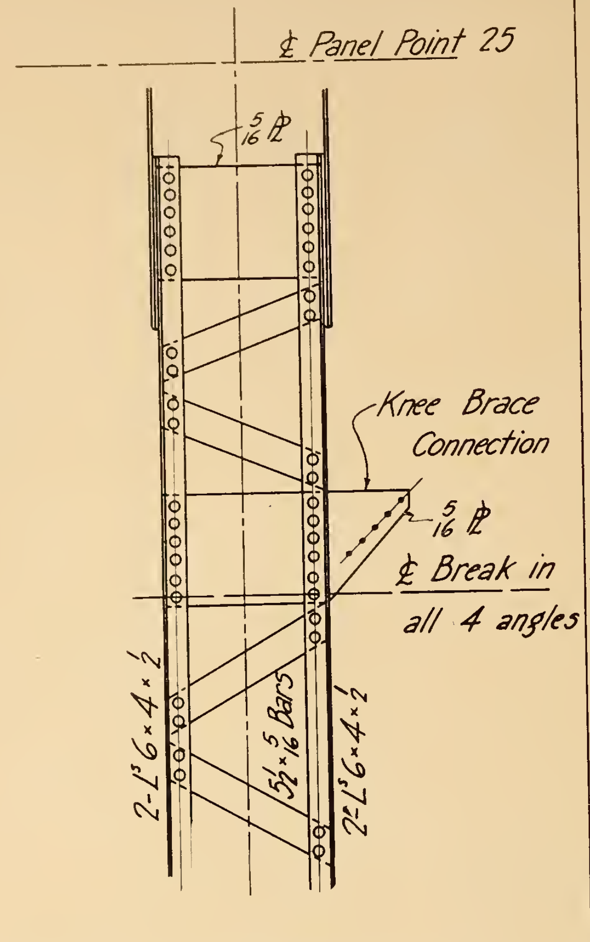
This member had been composed of four (4) angles, 6 in. by 4 in. by $\frac{1}{2}$ in., and all four angles were completely fractured, with the break occurring in the member immediately below the knee brace connection and through a section of minimum area. The break had evidently been in existence for some time, and, when first observed, the joint was open about 1 inch. There was no evidence of reduction of section, and the fracture was sharp and square with the member. Figure No. 2 is a picture of this break, and Figure No. 3 is a sketch of the member.

"(2). Member 24-26; East counterweight truss; two out of four angles fractured."

This member had been composed of four (4) angles, 6 in. by 4 in. by $\frac{1}{2}$ in., and two (2) flange plates, 15 in. by $\frac{1}{2}$ in. The flange plates did not extend for the full length of the member, but stopped about one foot from the edge of the gusset at Joint 26. Immediately adjacent to the end of the flange plate on one side of the member,

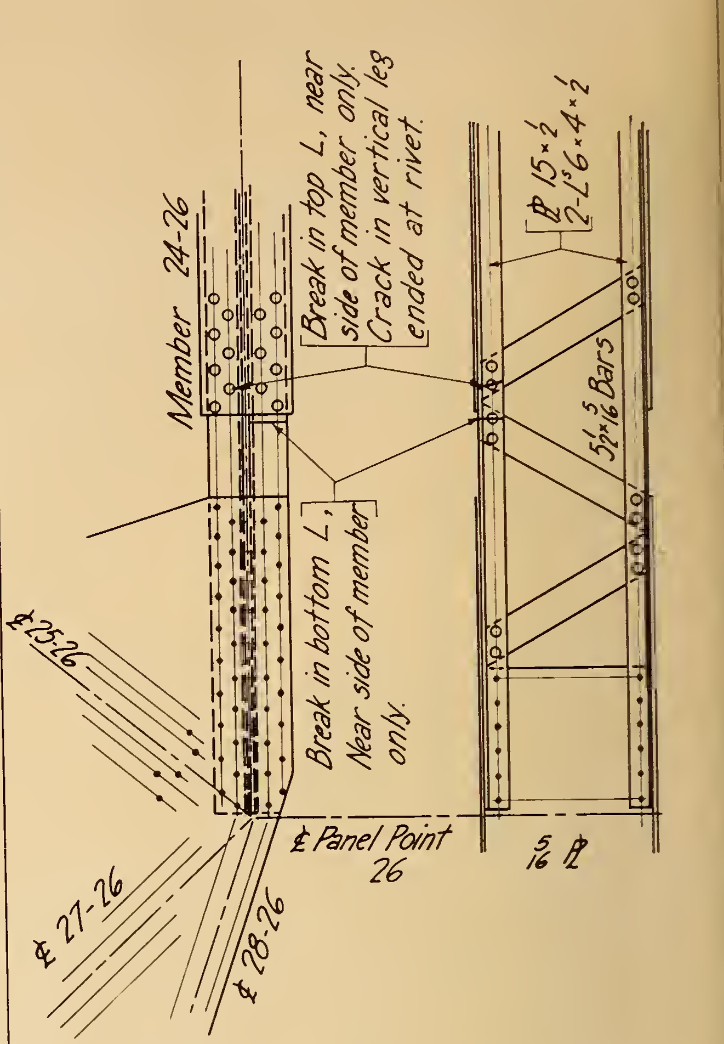
Fig. 2—Break in Member 25-27.





DETAIL OF MEMBER 25-27 SHOWING LOCATION OF BREAK

FIG. 3



DETAIL OF MEMBER 24-26 SHOWING LOCATION OF BREAK

FIG. 4

the bottom angle was completely fractured, and the lower half of the upper angle was also fractured. Figure No. 4 shows a sketch of this joint indicating the fractures.

"(3). Member 24-26; West counterweight truss; two out of four angles fractured."

This fracture was similar to that described under (2) above.

"(4). Member 20-24; East counterweight truss at Panel Point 25; one out of four angles fractured."

This member was composed of four (4) angles, 6 in. by 4 in. by 5/8 in., and four (4) web plates, 24 in. by 1/2 in. Two of the four web plates extend for the full length of the member, with the other two running from Points 20 to 25, ending slightly past Panel Point 25. The break in this member occurred in the bottom inside angle of the member. Figure No. 5 shows a sketch of this joint indicating the fracture.

"(5). Member 20-24; West counterweight truss at Panel Point 25; one out of four angles fractured."

This fracture was similar to the one described under (4) above.

Apparent Reasons for Failure

Consider Member 25-27. This member was composed of 4 angles, 6 in. by 4 in. by 1/2 in., with a gross area of 19 sq. in. and a net area of 15 sq. in. A check of the actual detail verified this net area. The design stress in the member was 200 kips plus 20 percent for impact, giving a total of 240 kips tension. At the basic unit stress of 16 kips per sq. in., an area of 15 sq. in. is required.

With the counterweight down, taking moments about a vertical line through Point 26 and neglecting, for the moment, the weight of the steel, we would have a stress of 136 kips tension. With the counterweight up, and taking moments about a vertical line through Point 26 of the whole volume of concrete in the counterweight, a stress of 316 kips tension is obtained.

The design figure of 200 kips was probably arrived at by the assumption that concrete above Line 25-26 would not contribute to the stress of Member 25-27. The assumption would seem entirely reasonable, as long as the whole mass of the concrete counterweight was an integral unit, securely bonded to all parts of the encased steel.

Disintegration of the concrete, with resulting deterioration in the bond between it and the steel.

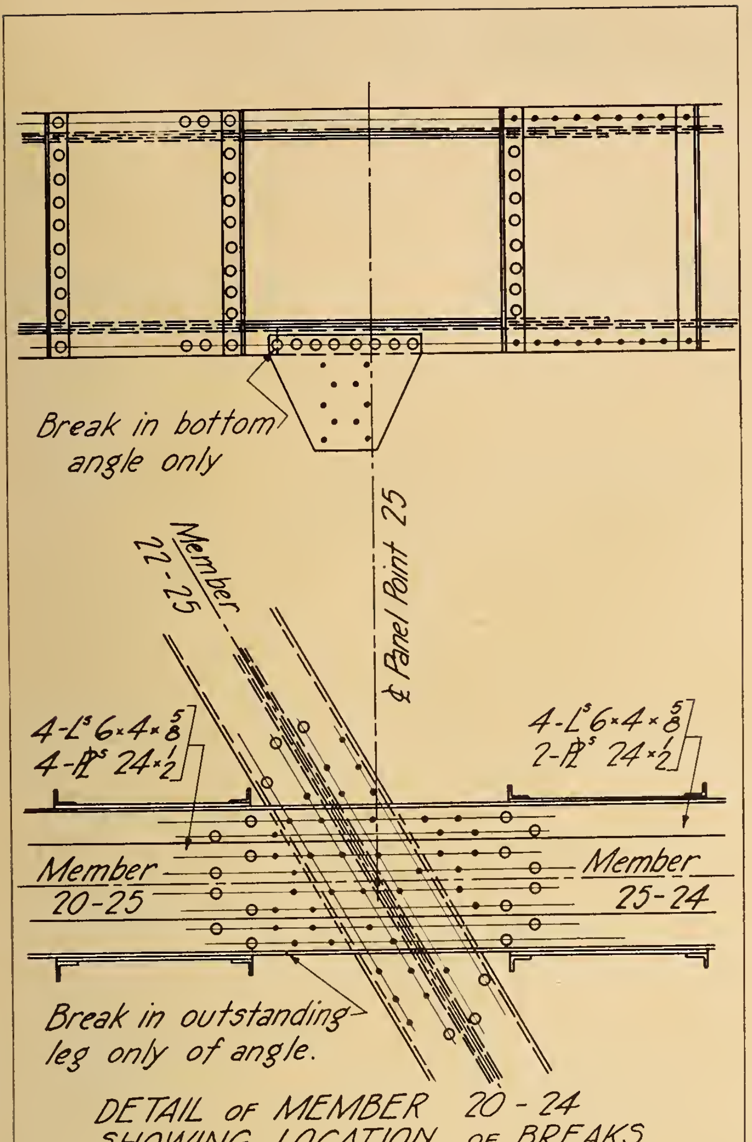


FIG. 5

would conceivably give a stress somewhere between the 200 kips used in design and the 316 kips mentioned above. Accompanying this increased direct stress, and also due to the deterioration of the concrete, severe bending stresses would be possible to such an extent that a 20 percent impact allowance would seem inadequate.

The failures in Member 24-26 were identical failures, and it was apparent that they had been induced by bending stresses. These bending stresses would be set up when cracking of the concrete had so progressed that large portions of the counterweight would be freed to create local bending in the member. The failures in Member 20-24 at Panel Point 25 were also identical failures, and in a symmetrical position. They occurred in one angle of the member only, starting at the extreme fibre of the member and extending in to the heel of the angle.

The fractured angle was located on the side of the member towards Point 27, and on the inside of the bridge. Due to the shape of the counterweights, the fractured pieces of angle would be the most highly-stressed material in Member 20-24, at Point 25, for ordinary operation with the concrete portion of the counterweight adequately bonded to the enclosed steel. In addition, the member is subject to reversal of stress in normal operation. The condition existing in this member when the counterweight concrete had become severely cracked, would be one in which bending and reversal of stress could become major factors eventually resulting in failure.

Other Measures Taken

The condition discovered in the counterweight trusses after removal of the concrete amply justified the decision to replace the counterweights. If no action had been taken, and the condition of the counterweights allowed to grow progressively worse, there seems little doubt that the counterweights would eventually have dropped off with results many times more costly than the repairs undertaken.

In addition to splicing and reinforcing the fractured members, various other steps were taken to strengthen the structure. All corroded material inside the counterweight trusses was either reinforced or replaced. Member 25-26, which could have given trouble similarly to Member 24-26, was reinforced in both trusses. U-shaped reinforcing rods were welded to all large gussets to bond the concrete to the steel in these areas more satisfactorily.

A 3-foot wide rib of concrete was added in the upper void in the counterweights near Point 25. It was felt that, in addition to giving better protection for the steel at this point, considerable shear strength would be added to the concrete in a very important area. A new steel brace frame was also added between the counterweight trusses in the plane of Member 25-23, thus greatly increasing the stiffness of the structure resisting the eccentric moment set up by the counterweights.

Conclusions

Certain conclusions may be drawn from a study of the facts in this instance, and it is possible that these may be of use to others who encounter a similar problem. It seems a reasonable assumption to say that, in bridges of this type, the counterweight trusses have not been designed for stresses other than those caused by the dead load of the concrete and steel, assuming that the bond between these is sufficient to carry the concrete load into adjacent panel points. Hence, when this bond between the concrete and steel is disturbed by extensive cracking and deterioration of the concrete, stresses will be set up in some of the truss members caused by bending. These stresses are quite likely to be subject to reversal, and they will not have been provided for. If the failure of the concrete is severe enough, and at a critical point, then damage to the steel counterweight trusses can be expected.

Forest Management in the Eastern Rockies

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada, at Banff, Alta., June 2, 1948.

by

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The author, who is chairman of the Eastern Rockies Forest Conservation Board, explains why the Board was created, and gives an outline of its composition and its major problems, with its approach toward, and hopes for, the solution of these problems.

The Forest Reserves

In 1930 the Dominion Government turned over to the Prairie Provinces the natural resources lying within their boundaries. In the case of Alberta, the resources included a group of forest reserves, situated in the foothills of the Rockies and contained the headwaters of the major tributaries of the Saskatchewan and Athabasca Rivers. For many years previously, the Federal Government had paid particular attention to these reserves, and guarded them jealously on account of their importance to the control of stream flow in the rivers draining them.

The forests on these foothill reserves, although of considerable extent, are not Alberta's most valuable timber stands, which are located on the flat lands north and west of Edmonton. Lodgepole pine and spruce are the major conifer species on the slopes, while poplar is the only important deciduous species.

The area within the forest reserves which is treated in this paper is about 9,000 square miles in extent and lies just east of Jasper and Banff Parks, extending southward along the boundary of British Columbia as far as Waterton Lakes Park. It is somewhat wedgeshaped, varying in width from 15 miles at its southern extremity to over 50 miles in the north. There are corridors piercing it in the Cows Nest and Bow River districts.

The Saskatchewan River

Together with the National Parks mentioned, the area encloses the source of all the head waters of both branches of the Saskatchewan River. The major tributaries of the South Saskatchewan include the Oldman, the Bow and the Red Deer, while the North Saskatchewan which rises in Jasper Park is joined by the Brazeau and the Clearwater. These streams have in turn many tributaries, some of them of considerable size. The north and south branches of the Saskatchewan River join near Prince Albert and continue on to Lake Winnipeg, where their waters mingle with those of the other tributaries of the Nelson River.

The Saskatchewan River is by far the most important stream serving the Prairies, and is of vital importance to the continued development and prosperity of all three provinces. All the irrigation schemes already developed or projected, with one exception, that of the Milk River in Southern Alberta, are dependent on the waters of the Saskatchewan. The major hydro electric developments already installed in Alberta are all located on branches of the Saskatchewan. Future hydro developments west of Lake Winnipeg on the prairies will, no doubt, be dependent upon the controlled flow of this great river. With power or irrigation dams and an augmented summer flow it is not unreasonable to expect that inland water transport might again become an important element in that part of the prairies served by the Saskatchewan River.

Inter-Provincial Aspects

It will be appreciated that although the source of the Saskatchewan lies in the foothills of Alberta, its flow is of major importance to the other Prairie Provinces. Existing or projected irrigation schemes and power developments are of little avail unless there is an abundant supply of water in the streams feeding them. It could well happen that millions spent on such development could be rendered ineffective in dry seasons unless the future flow of the river is provided for. Even the fur farms on the marshes in Northern Manitoba are dependent upon water from the Saskatchewan River.

Formation Of The Board

The Federal Government, as well as the Provincial governments concerned, has been well acquainted with the inter-provincial aspects of the Saskatchewan River. It is recognized that forest cover has disappeared from parts of the forest reserves and that the glaciers which provide much of the summer flow of mountain streams on the east slopes are disintegrating at varying rates. In a few decades the influence of the glaciers will be considerably diminished, if indeed it has not disappeared.

Negotiations carried on for several years between the Federal Government and the government of the Province of Alberta resulted in an Agreement signed in 1947, later ratified by both governments, whereby "The Eastern Rockies Forest Conservation Board" was formed to administer that portion of the forest reserves on the eastern slopes, which includes the streams feeding the Saskatchewan River as outlined in an earlier paragraph.

Composition Of The Board

The Board consists of three members, a chairman and one member appointed by the Federal Government and one member appointed by the Government of Alberta. The salaries and travelling expenses of these members are paid by their respective governments. The other members of the Board are J. M. Wardle, M.E.I.C., of the Department of Mines and Resources representing the Federal Government and H. G. Jensen, former police magistrate of Calgary, representing the Alberta Government.

Financial Arrangements

The contract between the governments provides for an annual fund of $300,000 for 25 years for the operations of the Board. This is divided between the governments on the basis of $125,000 provided by the province, which receives returns for timber sales, grazing rights, etc., up to that amount, and $175,000 provided by the Federal Government. In addition to these continuing maintenance funds the Federal Government has provided $6,300,000 to be applied during the first six years of the contract for capital expenditures necessary to carry out remedial measures found necessary, by the Board.

Method Of Carrying Out Work

All work is done by and through the Government of Alberta. The Board acts more or less in the capacity of a firm of consultants. For instance: They decide what intensity of fire protection will be adequate, and what engineering projects are necessary. This is communicated to the Alberta Government which actually carries out the forest protection measures itself, and may arrange for work on construction projects to be carried out by contractors if it is not feasible to do it by day labour.

The Board provides the plans and specifications for all work, and carries out inspection as the work proceeds. It pays for, or arranges for the payment of, all accounts in connection therewith. This entails close liaison and cooperation with the engineering and forestry services of the Alberta Government and the accounting and auditing services of both governments.

Staff

The staff of the Board is organized under three divisions,—Administration, Engineering and Forestry. Office Administration, which includes public relations, has been allotted to the secretary of the Board; engineering which includes all surveys except those pertaining to forestry, preparation of plans and specifications for all construction work and supervision of this work constitute the main functions of the chief engineer. In addition to forest protection the chief forester is responsible for all forest inventory and the preparation of working plans for the operation of the forests. Forest research, nurseries (if any) and studies of the effects of grazing and similar studies are also within this field. Adequate technical and clerical assistance are provided for all branches.

The main office is in Calgary, and the chairman maintains an office in Ottawa where the Eastern Rockies Board shares an executive assistant and a stenographer with the Forest Insect Control Board.

Work To Be Carried Out

The Board recognizes that the main reason for its existence is the maintenance of forest cover on the territory allotted to it. All other activities are subsidiary. With this in mind it has realized that its first duty lies in protecting existing forests from further losses from any reason, whether the threat be from insects, disease, fire, fungi, animals or human beings.

In order to give adequate protection it is also realized that it is necessary to be able to reach every portion of the territory quickly. The first major construction projects are therefore concentrated in the development of a north-south road system, which will be tied in to the municipal and provincial road systems to the east and with the parks system of roads and trails on the west. The skeleton lay-out of this road system has been decided upon. Surveyors are already at work laying out the centre lines for the current season's work. Construction on the road system will be pushed with all possible speed.

Studies of other remedial measures necessary for the control of the streams on the reserve will be commenced this year, as well as studies on the effect of grazing by cattle, sheep and horses of which upwards of 30,000 head are pastured annually on the reserve.

Disastrous fires have denuded a large portion of the area from Red Deer River southwards. The area northwards, however, has not suffered badly in recent decades, and already carries a reasonably good stand of timber which has only to be protected. Experiments will be undertaken to ascertain the feasibility of utilizing faster growing species than lodge-pole pine on denuded areas. It may be necessary to develop nurseries. If so, such development will be fitted into the long term plans of the Dominion and Provincial Forest Service. The policy of the Board is definitely directed toward utilization and development of existing services, federal and provincial, rather than toward building parallel organizations of its own.

Slopes facing south and west

have not shown any worthwhile regeneration following fires and their reforestation poses a challenge which may be very difficult to solve. The quick run-off of melting snows and rains and the very high ground temperatures experienced under the direct rays of the summer sun both create conditions which may frustrate the establishment of seedlings under normal methods of developing forest cover.

Public interest requires that, as mentioned earlier, the Board shall maintain the closest possible liaison with both Federal and Provincial Forest Services and Departments of Agriculture, as well as with the Universities. All these groups have indicated their great interest in, and willingness to assist, the Board in solving its problems.

A working arrangement with the Fish and Game branch of the Province is also in effect. Mutual assistance in the matter of quickly extinguishing fires has been arranged with all neighbours. Fires will be attacked, as soon as detected, by the nearest personnel available with repayment by the agency controlling the area involved, whether it be the provinces of Alberta or British Columbia, the National Parks or the Municipalities bordering on the Reserve.

Federal-Provincial Aspect

The Board is conscious of the tremendous responsibility resting on its shoulders, due to the fact that this is the first example of joint Federal-Provincial attack on forest problems on any scale approaching that of the present undertaking. It is also aware that the summer flow of the Saskatchewan River in a few decades will depend largely on the measures it will carry out within the next few years. The future of co-operative schemes of similar nature elsewhere in Canada may depend on the success or failure of the present actions of the Eastern Rockies Forest Conservation Board. If it acts wisely, the Eastern Rockies project may well result in a more closely knit attack by Federal and Provincial governments on the problem of forest management than has been achieved in the past. In any event it provides for the most comprehensive project of forest management, with assured funds sufficient to do a useful job, that has yet been attempted in Canada, if not on the American continent.

The Future

If the work of the Board is carefully planned and wisely administered it could be the first step toward a more comprehensive Authority which will deal with the use of water in the watershed of the Saskatchewan River. The Board recognizes that provision of forest cover is only one step in the solution of a vast and complex problem.

The use of water for power creates problems of changing water-levels in lakes and streams which are claimed to be detrimental to fish life. It also creates aesthetic problems as well as problems of ice jams and their disposal. The use of water for irrigation on the upper stretches of the Saskatchewan may well reduce the lower stretches to a mere trickle in periods of drought or low summer flow. Irrigation projects already on draughting boards will, if constructed, require annually several millions of acre feet of water. Then there is the question of possible utilization of the river for inland navigation.

These are problems which are not possible of solution by any one province. It would therefore seem that a Saskatchewan River Authority will eventually be necessary to correlate the needs and rights of the various groups who may wish to make use of the waters of the Saskatchewan. The scope of an Authority of this nature is a matter for study and argument by those concerned. The necessity for some central Board is, to the author, beyond question.*

Conclusion

The main concern of the Board is that the public may expect quick results in the way of flood control in spring and increased stream flow in the summer. It is therefore taking pains to emphasize that no measures it can possibly undertake will result in quickly controlling the flow of the Saskatchewan River or its main tributaries. In dealing with forest management a calendar measuring time in quarter and half centuries is far more appropriate than one dealing in years. No miracles will be attempted.

The aim of the Board is centred on the long term project of controlling the run-off created by the relatively high precipitation on the eastern slopes, thereby providing for the maximum useful summer flow of water in the Saskatchewan River so that the disappearance of the glaciers will not be disastrous. In achieving this aim it is expected that a very considerable measure of stream control will become progressively effective. This will decrease the peak floods which now do so much damage, and will increase the minimum flow of the Saskatchewan and its tributaries.

The by-products of the Board's actions should be gradually improved fishing and hunting, easier to reach because of the road system provided. Also the development of Natural Resources including coal, lumber, ties, poles, mine timbers and pulpwood will be made easier as all parts of the area become more accessible.

In approaching their problems the policy of the Board is similar to that so well stated by David E. Lilienthal in his book "T.V.A.—Democracy on the March", when he said, "I believe men may learn to work in harmony with the forces of nature, neither despoiling what God has given nor helpless to put them to use".

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* Shortly after the presentation of this paper at Banff last June, Ottawa announced the formation of the Prairie Provinces Water Board. See *The Engineering Journal,* February, 1949.

ECONOMIC IMPORTANCE of the ELECTRIC BOILER

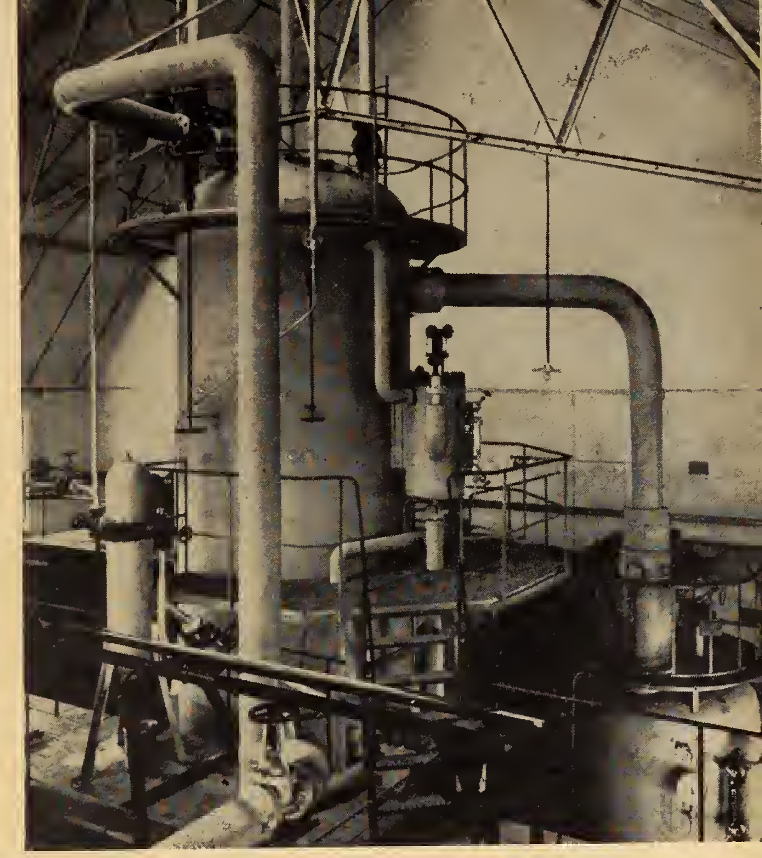


Fig. 4. Electric steam boiler for 6,000 kw., 10,000 volts and 250 lb. pressure, with closed primary circuit and steam transformer for the secondary circuit (consumption system) at 170 lb. pressure.

The following paper was prepared by engineers of Sulzer Brothers, well known Swiss Manufacturers of Electric Steam Boilers.

In response to a number of requests from the membership that the Journal should publish articles embodying the thinking and practice of foreign engineers, this paper, which contains a discussion of European practice relating to steam boilers, is reproduced. It has not appeared elsewhere in Canada.

The fullest possible utilization of waterpower is of the greatest importance in the national economy of many countries, and not least of Switzerland. While the hydro plants in such countries have difficulty in satisfying the growing demand for winter energy, in summer considerable water is wasted. Here the fundamental problems of an electricity supply based on water power will be briefly reviewed, and the importance of the electric boiler in the framework of the system explained.

Modern trade and industry depend to a large extent on the rational utilization of the available sources of power. The world's principal source of power was, and still is, coal. Its importance is enhanced by the fact that it not only stores up energy, but also yields valuable chemicals. The part played by water power in the world production of energy is modest by comparison. For countries such as Switzerland or Scandinavia, however, which possess neither coal nor any other heat-yielding raw material in any quantity, but have water power at their disposal in comparative abundance, the latter takes up a key position in the national economy.

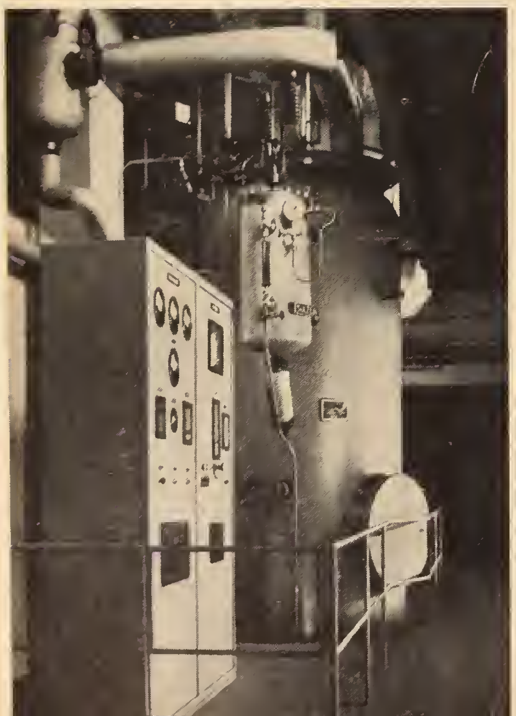
This fact has won wide recognition in the course of time, and has called forth numerous studies, plans and projects for the further utilization of water power. Careful calculations, however, have shown that in densely populated areas such as Switzerland, even after full development of all water-power schemes which are technically and economically feasible, the energy thus produced will not be sufficient to cover the steadily increasing requirements. There can therefore be no question of a surplus.

Fig. 1. Diagram of the daily energy consumption in a large urban electricity works on a winter's day (upper curve), and on a summer's day (lower curve). Abscissae are hours from midnight; ordinates are demand units.

Fig. 2. High-tension line of the Brusio power station, with a view of the Lake of Poschiavo. Electric boilers may be used to improve the economy not only of the power station itself, but also of the costly transmission lines.

The exploitation of hydro-electric energy is further complicated by the circumstance that just when the demand is greatest, the waters flow least abundantly: in winter, when light and heat are most needed, the rivers are at their lowest, while in summer, when demands

Fig. 3. Electric steam boiler of 4,500 kw., 3,000 volts and 170 lb. per sq. in., with control panel for the automatic supply of feed and pressure water in a co-operative agricultural establishment.



are less, a surplus of water is available.

Even during the day, however, electricity requirements are subject to large fluctuations, depending on our daily habits. The daily consumption curve of any district has marked peaks and valleys, the highest point—for example on a winter's day — probably lying somewhere between eleven and twelve o'clock in the morning, the lowest point between four and six in the morning (see fig. 1). The possible production of a hydro-electric plant remains practically constant during the course of the day. This means that at certain hours the output of a station is needed in full or may even be insufficient, while at other times, and specially in the night hours, a surplus of energy is available. Non-utilization of this surplus, from the viewpoint of national economy, not only represents a waste but also impairs the overall utility of the very costly plant.

This position illustrates graphically the difference between electric energy, which must be employed at the moment of its generation, and that contained in such fuels as coal or oil, which can be stored up as long as desired. The rational exploitation of water power therefore postulates the solution of two problems: 1. The creation of some balance between superfluous summer energy and increased winter demands. 2. The uniform distribution of consumption over the hours of the day.

A solution of the first problem consists in the erection, where possible, of power stations with compensation reservoirs, i.e. with artificial lakes in which the surplus summer water may be stored up, to be used for the generation of power to cover the extra demands in winter (fig. 2). Plans for new storage power stations have already been made, for instance, in Switzerland, but decades will be needed for their execution, so that any complete equalization of the seasonal discrepancy between supply and demand cannot be expected from this quarter for some time to come.

Other means of exploiting surplus summer energy must therefore be sought. At the same time an approach must be made to the second problem, that of the uniform distribution of power consumption over the twenty-four hours of the day.

Using Surplus Energy in Boilers and Heat Accumulators

There are today numbers of concerns which require considerable quantities of heat in the form of steam or hot water for their manufacturing processes, during both summer and winter alike. This energy was formerly supplied, as it is in part today, by coal, which prior to World War I could be imported at favourable rates. It was during World War I, however, that a coal shortage and rapid price increases for liquid and solid fuels made themselves felt. This prompted endeavours to discover the best method of transforming electric into thermal energy.

The electric boiler here offered the best solution (figs. 7, 3, 4, and 5). It can be connected up to work in combination with an existing fuel boiler plant, thus helping to solve the problem cited above by utilizing surplus summer energy. The coal saved in this manner can then be reserved for winter. For countries poor in coal this is an inestimable advantage, since coal imports are reduced and the hydraulic energy production turned to fuller account. For private concerns this solution makes it possible to maintain production despite lack of coal. Moreover, when the price of coal is high the savings on fuel enable the outlay for the electric boiler to be redeemed in a very short time. Finally the electric power station can in this way dispose of its surplus summer energy and thus make its plant more productive.

There now remains only the second problem, that of distributing this use of summer energy as rationally as possible over the twenty-four hours of the day, that is, of allocating it to the times of lowest demand. This end is largely served by providing heat accumulators which can be charged during the night hours and over the week-end (figs. 7 and 6). The stored-up heat is then put to use during the day, thus fulfilling the needs of the power station, and benefitting industrial undertakings which can use the cheap surplus energy. If the industrialist possesses his own waterpower plant, the accumulator enables him to store the surplus energy from his own turbines in the form of heat, and to make it available to his factory.

In electric boilers and accumulators we thus have a means of utilizing water power on a rational basis, which is equally interesting for national economy and for private enterprise. The electric boiler offers substantial technical advantages in service. It is characterized by high working reliability, immediate readiness for service, rapid adaptability to changing steam consumption and clean operation. Owing to its small space requirements, an electric boiler plant can be installed with a comparatively small outlay. Its low servicing costs, due to the elimination of supervision, combustion chamber attendance and ash removal, further help to make it a paying proposition.

balance in the consumption of energy and a definite economic advantage for the private industrialist.

Generally speaking, the choice of boiler type, working pressure, and transformer and accumulator arrangement depend not only on questions of heat economy but also on existing space conditions and on the position with regard to feed-water supply and condensate return. A comparison of the energy consumption of the different types of electric boiler reveals with what arrangement the best results can be attained.

According to individual requirements dictated by the type of heat needed and the contracts signed

Fig. 5. Electric steam boiler of 2,000 kw., 8,000 volts, and 210 lb. per sq. in., equipped with automatic regulation of output, pressure and feed water and installed in a paper mill.

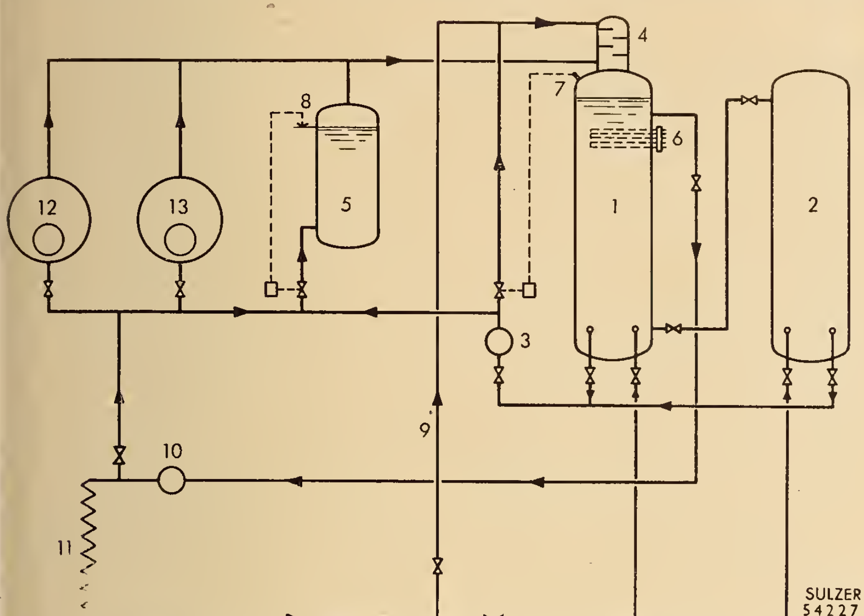


Fig. 6. Diagram of an electric hot-water accumulating plant in a textile factory.

Particularly favourable results are obtained when an electric boiler and accumulator plant are combined with an existing fuel boiler by connection in parallel; in this way a reserve of energy is created. Another measure that can be recommended is the adoption of disused coal boilers as steam or hot-water accumulators.

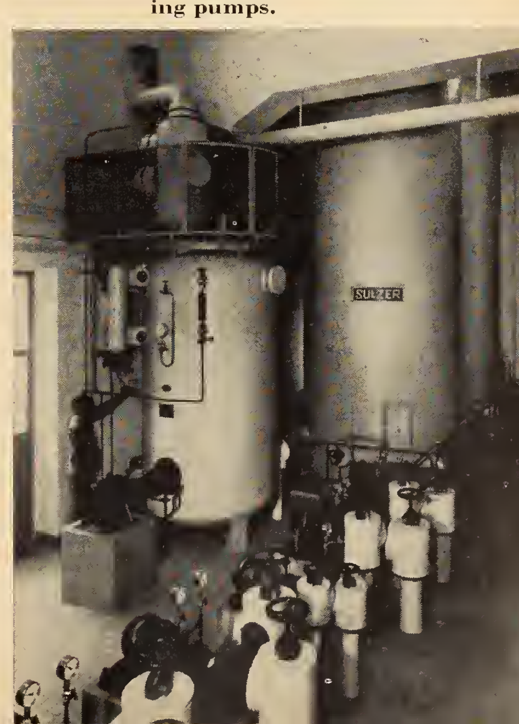
Electric Boilers in Trade and Industry

Curves depicting cumulative yearly installations of Sulzer electric boilers, which take a rising course not only during the crisis in the thirties but also during the more favourable economic periods, demonstrate that the electric boiler is not by any means a stop-gap. Experience goes to show instead that even in stable economic conditions, it brings with it a welcome

with the power supplying works, electric boiler plants may take any of the following forms:

1. Electric steam boilers and electric hot-water boilers with automatic regulation to a constant pressure or temperature, alone or combined with fuel boiler plants.
2. Electric steam accumulators (electrodes fitted in accumulator) with hand-operated remote electric control (output regulation) and with automatic time-regulated energy supply, in combination with fuel boiler standby.
3. Stratified superheated water accumulators, with automatic charging employing surplus power from outside mains or from private power plant, with resistance (indirect) heating or with electrodes.
4. Electric steam boilers with manual and automatic regulation to constant pressure and constant output, combined with heat transformers and possibly with fuel boiler plant.
5. Boilers with electric resistances for step-by-step regulation by hand or automatically by means of selector switchboard or programme switching.

Fig. 7. Electric hot-water accumulator plant in a textile factory. On the left a Sulzer electric boiler of 600 to 2,600 kw. capacity at 185 lb. per sq. in.; beside it two hot-water accumulators of 3,500 cu. ft. each with the circulating pumps.



6. Combined electric-oil and electric-coal steam accumulators and steam boiler plants.

The types of undertaking in which such plants are required include the following: Cellulose factories, dye-works, bleaching works, spinning and weaving mills, chemical works, boot factories, breweries, chocolate factories, agricultural concerns, cider factories, laundries, disinfecting institutions, public baths, district heating plants, hospitals, churches, etc.

An Electric Hot-Water Accumulator in a Textile Factory

A Swiss textile factory was confronted by a double problem: 1. To limit its consumption of outside power for heat requirements to times of lowest demand, and thus of lowest current price. 2. To utilize the surplus power from its own water-turbine plant for heat requirements.

This double aim was fulfilled by the installation of two electric hot-water accumulators, which were connected up to an existing mixed fuel and electric boiler plant. As can be seen from the diagram in fig. 6, the heat generating plant comprises two fuel-fired steam boilers (12 and 13), one electric boiler (5) and two hot-water accumulators (1 and 2).

An economizer of 64 sq. m. heating surface is connected up to the fuel boiler (12), which has a horizontal grate and a heating surface of 68 sq. m. The other fuel boiler, with a surface of 112 sq. m., is equipped with an underfeed stoker and an economizer of the same size. With the exception of the fuel boiler (12), which has a working pressure of 8 kg. per sq. cm., the heat generating plant works at a pressure of 13 kg. per sq. cm.

The electric boiler is designed for a maximum input of 2,600 kw. while the total capacity of the two accumulators (1 and 2) corresponds to 12,000 kwh. of energy. The first of the two hot-water accumulators is provided with a heat transformer for steam and hot water (4) with a capacity of 5,000,000 kcal. per hour. In the top of the accumulator (1) are fitted the electric resistances (6) which heat the water in the accumulator. The total connected load amounts to 700 kw. and is divided into two main components. 400 kw. are reserved for the firm's own surplus energy and 300 kw. for power from the mains.

The water contained in the accumulator can be heated up to 190 deg. C. Heating is done either with steam from the electric boiler, using energy from the mains, or by the resistances in the accumulator (1), in which case power can be taken either from the firm's own plant or from the mains, or finally both methods may be employed together. The expansion of the water in the circuit is taken by accumulator (1), the expansion space being so dimensioned that it can deal with a rise of the water temperature from 100 deg. up to the maximum of approx. 190 deg. C.

Accumulation by Switching on Electric Heating Resistances

a) Using Self-produced Energy:

Every surplus kilowatt-hour produced by the water turbine is diverted by a special automatic control to the accumulator, where it is used for heating the water. The control is brought into action by a wattmeter which, as soon as surplus is available, switches on the heating steps reserved for self-produced energy 8 kw. at a time (up to 400 kw.) through the controller and impulse transmitter. When the accumulator has reached the maximum service pressure, the energy supply is interrupted by a push-button switch. The electric connection of the control equipment is such that, even if the outside current responsible for the control impulses should fail, the step-by-step control of the self-produced energy can be maintained through hand-operated switches.

b) Using Mains Supply:

The starting of electric motors installed in the factory and run on self-produced energy has the effect that the maximum capacity of 400 kw. intended for the accumulator is no longer available. The interaction of the energy supplies from the factory plant and the mains is therefore so arranged that the regulator automatically switches on sufficient outside energy to compensate for shortages of self-produced energy. A further possibility is the exclusive use of outside energy, which can be switched on independently of the self-produced supply when desired.

Accumulation Through Electric Boiler With Outside Current

Charging of the two accumulators can be done with the electric steam boiler of 2,600 kw. connected load, in which case cheap night current is used. The capacity of the two accumulators in summer permits the full heat requirements of the following day to be met.

The charging of the accumulator proceeds as follows: the charging pump (3) delivers the cooled water from the accumulator (1 or 2, according to whether one or both are to be charged) into the 2.5-metre high cascade transformer (4), where it is heated to 190 deg. C by the steam from the electric boiler (5) or by the electric resistance(6) fitted in the accumulator, after which it settles in layers over the water level with the condensed steam. The delivery quantity of the charging pump is regulated in accordance with the accumulator pressure by means of a rheostatic pressure regulator (7), i.e. the quantity of water is adapted to the quantity of heat introduced in the form of steam, and the accumulator pressure is thus kept constant. The electric boiler is fed through the high-pressure pipes, the feed being automatically regulated by the rheostatic level regulator (8).

When the maximum accumulator pressure is reached (and charging thus completed) the electric boiler is first cut out, and afterwards the heating. If the pressure is reduced by the circulation of hot water in the heating system, the electric convector is automatically switched on again. If the heat produced just suffices for factory needs (so that there is no accumulation), the cooled water is conducted through the pipe (9) direct into the cascade transformer, while the feeding of the electric boiler is in this case effected from the industrial water supply. During the winter, when little or no surplus energy is available, the two fuel boilers take over the steam production, one of them serving as standby. The return water is again led direct into the transformer. There is no heat storage, but only temporary accumulation to cover peaks of heat demand.

The installation of accumulators in this plant enabled about 4 million kilowatt-hours of night and week-end energy to be put to use, which of course represents a substantial saving of fuel for the coal-fired boilers.

Discussion of German Aeronautical Research

Editor's Note —

In the first instalment of the paper "Wartime Aeronautical Research and Development in Germany", by Messrs. Green, Hiscocks and Orr (The Journal, *October 1948) the authors discussed German wind tunnels in which air speeds greater than that of sound were achieved.*

Mr. Floyd K. Beach, of the Petroleum and Natural Gas Conservation Board of Alberta inquired as to the certainty that such supersonic speeds have been achieved and the resulting correspondence should be of interest to engineers familiar with gas dynamics.

Lt.-Col. R. D. King, director, Waterways Experiment Station, Vicksburg, Mississippi, inquired about the use of powdered amber for observation of water flow in the A-12 water tunnel at L.F.A., Volkenrode. Mr. Orr replied to this inquiry and this correspondence is also reproduced herewith.

Floyd K. Beach, M.E.I.C.[1]

As discussion of "Wartime Aeronautical Research and Development in Germany", could the authors answer a question?

Has it been definitely established that air velocities have been artificially set up in wind tunnels in excess of the speed of sound? The authors refer to "Mach numbers" of the order of 3.9, and some tunnels are spoken of as "supersonic", but is there proof that air velocities, set up artificially, exceeded that of sound?

Not being conversant with aeronautics, I approach the problem from the literature of natural gas, which quite definitely shows that gas flow may be accelerated by pressure differentials, and the associated phenomena conform to the law of falling bodies until the velocity approaches the speed of sound in the medium and at the existing conditions of temperature and pressure. Beyond that point there is no increase in velocity, and efforts to put more gas past a given point result only in crowding more molecules into a given space.

Some of the wind tunnel research may furnish data from which natural gas engineers can revise their formulae, and it will be appreciated if any light can be thrown on the problem.

J. J. Green, M.E.I.C.[2]

There is no doubt that velocities exceeding the speed of sound have actually been obtained in specially designed high-speed wind tunnels in several countries. For example, at the National Physical Laboratory, England, small wind tunnels giving speeds as high as three times that of sound have been in use for at least ten years. Some details of one of these tunnels and the method used in designing the working section for a specific speed are given in the *Proceedings* of the Institution of Mechanical Engineers for April, 1937, and again in September, 1937.

The technique for producing supersonic velocities in a closed circuit tunnel is briefly as follows. A compressor in the circuit delivers the air at a relatively low velocity to the contraction section of the tunnel. In this section the air velocity increases until at the narrowest portion of the section (usually referred to as the nozzle) the velocity has reached the speed of sound. The channel is then expanded in section, with the result that the air accelerates to supersonic velocities, at the same time suffering a rapid decrease in density. The precise speed obtained is a function of the design of the divergent nozzle and the power applied through the compressor. This is, of course, the reverse of the effect which a divergent nozzle has on subsonic flow, wherein an expansion causes a decrease in velocity. The changed behaviour in the supersonic case is dependent on the attainment of the speed of sound in the nozzle. It is then impossible for the suction of the compressor to be transmitted upstream past the nozzle and into the contracting section, because the speed of such a transmission would be the speed of sound and in the nozzle this is identical with the velocity of the stream which is travelling in the opposing direction. The sonic flow in the nozzle, therefore, acts as a special type of valve which enables the creation of a very steep favourable pressure gradient in the divergent section of the nozzle. With an adequate pressure gradient any desired supersonic velocity can be attained.

In some types of discontinuous tunnels this favourable pressure gradient is provided by means of an evacuated chamber and a quick-acting valve, as described in our paper.

After the test section a convergent nozzle is provided in which the flow is decelerated to subsonic values, with a corresponding increase in pressure, density and temperature, before returning to the compressor. It is of course necessary to provide a cooling system to absorb the power dissipated in the circuit.

When moving at supersonic velocities, the air conforms to the laws which govern the flow of compressible fluids and these are substantially different from the laws of incompressible fluid flow which control the motion of the air at subsonic speeds.

A good reference for further study of this problem is "Introduction to Aerodynamics of a Compressible Fluid", by H. W. Liepmann and A. E. Puckett, published by John Wiley & Sons.

Floyd K. Beach, M.E.I.C.

I greatly appreciate the explanation of the devices used in setting up supersonic velocities in wind tunnels. In most matters my work is far removed from aeronautics and I have been unable to follow its development. My observation of the phenomena associated with flow of gas at sonic velocity never inspired me to attempt to launch an aircraft at speeds exceeding it, and I fear I have read of attempts to set up supersonic velocities in wind tunnels with unbelief, or at least with the feeling that I must be shown.

I shall consult the reference mentioned, but on analysing Dr. Green's reply I believe that our practice of assuming sonic velocity a maximum in gas streams is quite in order in the usual circumstances where there is no expanding nozzle preceding the measuring point.

The principal application in natural gas work has to do with evaluation of open flow from large gas wells. The well is never called upon to sustain maximum flow for

[1] Engineer, The Petroleum and Natural Gas Conservation Board, Province of Alberta, Calgary.

[2] Chief research aeronautical engineer, Air Transport Board, Ottawa.

long periods except by accident, and the figure for open flow is consequently not of great practical interest although it is one that may frequently be quoted. The claim that supersonic velocity has been attained in wind tunnels made me wonder if some of our past valuations of open flow had been excessive, but from Dr. Green's explanation I believe we have been reasonably correct.

A case in point arose very recently, and I quote it merely to illustrate our side of the problem.

A well was being drilled in a location and at a depth where no gas occurrence of any importance could be expected. While pulling the drill pipe to change bits, the mud was blown from the hole and a large gas flow followed. A valve on the surface casing was closed, and in very short time gas appeared from perhaps a dozen craters, some fully a quarter mile distant. A flow line was connected to the well head to lead the gas away from the rig and the valve was opened to relieve the cratering. The well owner and the drilling contractor wanted an evaluation of the rate of flow. The only measurement made was side static pressure taken four diameters from the open end of the flow line, and its determination hinges on the assumption that gas issues at sonic velocity. Shortly afterward, heavy mud was pumped into the well and gas flow was cut off. The reservoir from which the flow came may be a small one, easily exhausted, or it may cover an area of some size. If it is significant, other wells may penetrate it, and our valuation of the rate of flow gives a measure of depletion during the period of wild flow. If the reservoir is insignificant in capacity, the occurrence is still of importance as a warning, although the exact rate of flow is not so important.

J. J. Green, M.E.I.C.

We were very interested to hear something of the problems in the natural gas field and can now appreciate Mr. Beach's interest in this question.

He is quite correct in the assumption that supersonic velocities will not be obtained in the case of open flow from large gas wells, unless the outflow pipe has an expanding section at the exit.

In the case of efflux from a straight pipe in which there is no expanding cross-sectional area at the exit, however large the pressure drop between the gas in the pipe and the atmosphere, the pressure and velocity at the opening itself retain the values corresponding to sonic speed. The quantity of gas flowing out is then quite independent of the pressure differential. Even if the external pressure is reduced to a very small value it will have no effect on the outflow. Upon emergence from the pipe, however, the cross-sectional area of the jet of gas will increase due to its internal pressure and because of inertia effects the expansion of the jet will continue to such an extent that a region of reduced pressure is created in its interior. In the course of this expansion a supersonic velocity will be attained. As a result of the reduction of pressure within the jet, the flow will become convergent and the pressure will rise until it approximates to that at the pipe opening. From now on the process will be repeated. This explains briefly the succession of shock waves which have been observed in high velocity jets of air and gases. Here again, the attainment of supersonic velocity is dependent on the expansion of the gas stream after it has reached sonic velocity, which in this case occurs at the exit of the pipe.

An interesting analogy to such supersonic flow, which should not be pushed too far, is presented by the flow of automobile traffic through a bottleneck. As the road widens from the bottleneck, the velocity of the traffic increases, and if another bottleneck is reached the traffic velocity is reduced. In some respects, therefore, the flow of traffic resembles the motion of a compressible fluid.

It has been reported that the United States Navy has achieved a wind tunnel air speed of Mach 5.18 or approximately 3,960 miles an hour at sea level conditions, in a captured and modernized German supersonic tunnel with 16 in. square working section, at the Naval Ordnance Laboratory in Maryland. The record speed was obtained at a temperature of 377 deg. F. below zero. The highest speed previously obtained in the same tunnel was Mach 4.38.

Floyd K. Beach, M.E.I.C.

On reading Dr. Green's remarks in the foregoing, I turned up some notes made about fifteen years ago to find a sketch I made of a high velocity jet of natural gas flowing from a straight nipple (Fig. 1). At that time I could recognize that there were several zones in the jet having different characteristics and the differences were quite clear cut. The quick enlargement in cross-section on emergence is the most prominent feature, but within the stream and, as I recall, made visual as a fog, there is a cone rising from the end of the pipe and

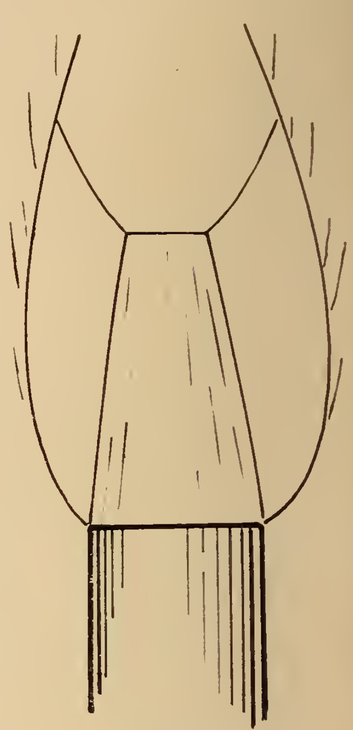


Fig. 1

truncated at the appearance of a second enlargement. This second enlargement does not extend outside the boundary of the main jet, and the jet loses its sharp outlines shortly beyond. What I did not sketch is a series of nodes extending upward at regular intervals, and sometimes numbering ten or a dozen.

Dr. Green's explanation makes clear that the truncation of the fog cone comes at a second shock wave, and the nodes of fog are a succession of shock waves. At the time I made the sketch I was at a loss to explain the phenomena, and the whole pattern of dynamics of gas movement was obscure. A bullet from a rifle can be projected at a velocity in the order of 3,000 feet per second, but any attempt to accelerate a gas by allowing it to issue through an orifice from a high pressure to a lower pressure is met by a limitation of the velocity of sound; or of the order of 1,000 feet per second. The bullet, in its trajectory meets no other projectile of a like order of mass, but a molecule of gas on being accelerated begins to collide with other projectiles of like mass and so long as collisions continue, the mean forward movement has as a limit the velocity of sound, which is a function of the square root of (specific heats ratio times pressure over density). The literature of natural gas goes into the matter of "linear" and "turbulent" flow. So long as there is a limitation of the speed of sound I can not now subscribe to gas moving in "linear" flow, but Dr. Green has made a clear case for linear flow as an explanation of supersonic flow.

Matter remains in a gaseous state only because each molecule has perceptible heat. When this perceptible heat is transformed into kinetic energy by lack of collisions with other molecules, acceleration should continue until the internal energy is exhausted. At the velocity quoted by Dr. Green, the energy has reached a very low point, and conditions are present for the formation of liquid air, although at such velocity coalescence into droplets could not be expected, and of course any checking of velocity is immediately reflected in a temperature rise.

At this point I search for criteria for measuring velocity. At subsonic velocities a Pitot tube can be used to measure impact and this can be converted to a measure of velocity, as a square root function of impact. When sonic velocity is reached impact no longer is a valid criterion, although it is useful in arriving at the quantity of gas passing in unit time. Under supersonic velocities, velocity should again be a square root function of impact, but under such unstable conditions as to cast doubt on the proper coefficient to use. I can now see the validity of the optical method quoted in the first instalment of the paper on German aeronautical research in the *Journal*.

For the natural gas engineer it becomes necessary only to recognize where and when sonic velocity is present. Work done about 1929 by the late Walter Reid suggests that when gas is emerging from the open end of a pipe, if pressure is measurable above atmospheric at a point four diameters from the end, sonic velocity has been reached. His formulas suggest that the absolute pressure at such a side static opening is 0.58 times the absolute pressure in a Pitot tube held facing the stream at a point in the centre of the end of the pipe. Under sonic velocity conditions it is often impossible to hold a Pitot tube in the stream, so the side static method has much value.

J. J. Green, M.E.I.C.

The subject of subsonic air flow is of course extensively concerned with the "laminar" and "turbulent" flow. In general, at high speeds (large Reynolds numbers) the unstable laminar regime is replaced by turbulent flow, but apparently little is known about the behaviour of fluids at supersonic speeds in this regard. In their book, "Aerodynamics of a Compressible Fluid", Messrs. Liepmann and Puckett conclude that turbulence, as recognized in incompressible flow, is scarcely possible in pure supersonic flow. Mr. Beach is quite correct in his statement that at very high supersonic velocities conditions exist for the formation of liquid air. This is in fact one of the problems to be overcome in high speed supersonic wind tunnels, where the expansion to high supersonic velocities causes a drop in temperature sufficient to reach that of condensation.

Regarding the measurement of high speed air flow velocities, the impact tube is still precise provided the correct formula is used relating the impact pressure to the free stream static pressure. The formula which holds for supersonic velocities is not the same as that which applies at subsonic velocities, except for the special case where the velocity is just equal to the speed of sound, when the two formulae are identical. The usual static hole in the conventional pitot head is no longer usable, however, because of interference from the shock wave ahead of the impact tube. It is therefore necessary to measure the free stream static pressure by means of a static orifice in the undisturbed flow remote from any shock waves.

I was interested to note the static pressure figure quoted by Mr. Beach, at a point four diameters from the open end of a pipe in which sonic velocity has been reached. References in the literature (for example, Eshbach "Handbook of Engineering Fundamentals") indicate that for the case of air or other diatomic gases, if sonic velocity is reached, the static pressure at the exit is 0.528 times the impact pressure.

R. D. King[3]

The recent article entitled "War-time Aeronautical Research and Development in Germany", in the October issue of *The Engineering Journal*, was read with considerable interest. The elaborateness and extent of equipment in contrast to the lack of co-operative effort between similar studies were of particular interest.

It was noted in the description of the water tunnel A.12 at L.F.A. that powdered amber was used to observe water flow around various shapes. We are interested in using this expedient in studying flow patterns in hydraulic structures.

It would be appreciated if additional information on the use of powdered amber could be made available to this office.

J. L. Orr[4]

The information on which this portion of our paper was based is contained in our original report to the British Intelligence Objectives Subcommittee BIOS No. 160. There will be further references to the use of water tunnels at A.V.A., Göttingen, in a subsequent article which is based upon BIOS Report No. 159.

In general the Germans employed four methods for rendering flow visible in water tunnels as follows:

1. Injection of a coloured liquid employing aniline dyes.
2. Injection of air bubbles.
3. The addition of aluminum filings in the form of plates approximately 0.5 mm. in length.
4. The addition of powdered amber 0.1 mm. in length.

It was stated that the powdered amber was preferred to aluminum filings due to its lower sinking speed. It should be noted here that the dimension quoted in our article for the size of the amber particles is incorrect and should read 0.0035" instead of 0.035".

I have been advised by our hydraulics laboratory that they have found aluminum particles of the abovementioned size to be too large and that they prefer to employ powdered aluminum similar to that employed in preparing aluminum paint.

[3] Lt.-Col. Corps of Engineers, director, Waterways Experiment Station, Vicksburg, Mississippi.

[4] Head, Low Temperature Research Laboratory, National Research Council, Ottawa.

A most interesting and novel feature of the A12 water tunnel was the incorporation of an electrical heating system to vary the kinematic viscosity of the water and thereby control the Reynolds number. Unfortunately our reference to this feature was deleted from the published article. With this system, it was found that by increasing the water temperature 45°C., the Reynolds number could be increased to 2.5 times. Excessive heating of water, however, gave rise to cavitation in the working section due to the low pressure of approximately ½ atmospheres. It was proposed to correct this by increasing the static water head on the tunnel but this had not been tried.

Notes on Management

Planned Execution

Extracted from an address given by Dr. Harlow S. Person to the Washington Chapter of Society for the Advancement of Management and published in Advanced Management, *December, 1945.*

. . . Scientific Management technique is a technique of approach; of approach to the solution of the management problem presented by each separate management situation. . . . It is a way of discovering what the particular management technique should be for each particular situation.

. . . The two major sectors of the technique (of Scientific Management) are: first, studies employing every resource of scientific method to discover the most suitable item, design, material, facilities for production and craftsmanship made available by the current state of technology—to discover, as Taylor put it, the laws of the managerial situation; and second, of arrangements, which are summed up in the word management, for bringing the laws of the situation discovered by the studies into dynamic creative relationship . . . Step by step research and arrangements must march along together.

. . . The major consequence, revolutionary in the field of management, of this coordination by Taylor of research and indicated arrangements is the creation for each enterprise of an institutional mind. This mind is independent of the personal minds of owners and managers, and of other individuals who may come and go, in whose collective activities the institutional mind expresses itself. This institutional mind has its powers of perception (investigation, research, experiment), of memory (records), of reasoning (analysis and comparison), and of design (planning and arrangement). Its life is coexistent with the life of the enterprise, and it can think and arrange affairs with that perspective made possible only by such characteristics. It has capacity to think in terms of experience larger than that which comes to any individual, to define distant goals, to arrange highly efficient ways and means of attaining them, and to pursue these distant ends consistently, yet with a flexibility which permits adjustment to changing conditions.

. . . It is the existence of an institutional mind that indicates whether an enterprise really has planning—that is, planning of a Scientific Management order. Planning in its generic sense—planning that is casual, expedient, personal, limited, unorganized—is not new. It began with the first human being and has continued ever since to be a natural practice of all individuals and groups. But planning that is identified with Scientific Management is highly organized and integrated, although in some enterprises it may be carried on in positions decentralized both vertically and horizontally. The institutional mind makes such planning possible, and planning is the major substance of that mind's activity.

The combination of centralization and decentralization of a highly organized and integrated planning function may be clarified by a schematic illustration. In an industrial enterprise characterized by Scientific Management on all its levels, there is an executive of high rank and competence responsible for the techniques and the coordination of activities of all planning units. Attached to the general administrative offices is a planning unit concerned with objectives, policies and over-all programmes. It discovers and organizes the data that constitute the basis of general administrative decisions; those, let us say, on the proprietary level. On the operating level, distinct from production planning and attached to the sales department, is a planning unit concerned with market analysis and sales programmes. In this unit originates the initial force governing operating activities in competitive enterprise; and it should be noted that there is necessarily a close integration of the studies and findings of the general administrative planning unit and this market programming unit. Attached to the sales department also is a supplementary planning unit concerned with direction of sales execution — quasi-planning and quasi-executive because it must plan execution of the sales programmes but also must manipulate and adjust selling activities by frequent changes of the plan to meet the variables of the market.

. . . It is because management is an art that planning is essential. Managerial situations are usually dynamic, day-to-day combinations of many variable elements. Human capacities and material facilities must be manipulated day by day to solve the problems presented by each day's peculiar combination of variables. What planning does is to bring science to the aid of the art in these day-to-day manipulations that effect control of variability. It is through the function of planning that research and arrangements are brought together and made to march along together.

With tools of scientific method, planning analyzes the cumulative experience of the enterprise and seeks to discover what elements in the experience are constant, what are variable and repetitive, and in so far as possible what are variable and fortuitous. For those that are constants it arranges routinized controls. For those that are variable and repetitive it arranges ways of detecting them, sometimes discovering their timing, and provides adaptable quasi-routinized controls for them. Those that are variable and fortuitous it handles as exceptions, focuses accumulated administrative and technological knowledge on each new such experience as it appears, and promptly makes to order a treatment to fit the circumstance.

Because it is a function of the management of dynamic situations, planning must be a continuous process. . . . Enterprises that are dynamic and changing cannot be planned once and for life. Planning is a part of the changing life, and, although relatively constant as to method, must in details of its arrangements and manipulations change to meet the changes presented by the stream of experience.

Planning must operate to the greatest possible extent in terms of standards. Among these are: precisely defined objective; precisely defined qualities and quantities; precisely defined technological ways and means of achievement, including human capacities as well as material facilities. These are the unit counters in planning's game with variability. These standards must be discovered by research and experiment. The behaviour of material things is governed by physical laws and the behaviour of human beings by psychological as well as physical laws, and it is discovery of these laws of behaviour that constitutes the research part of planning's responsibility. Once they are discovered, weighed, measured and evaluated, definitions and specifications must be formulated and maintained. The search is always under way for better standards, and from time to time a new standard is discovered and substituted for one that is obsolete; but until an established standard has been formally displaced, it must not carelessly or wilfully be disregarded.

Of outstanding importance among the standards required by planning is functional organization and distribution of responsibilities. Precisely who shall do what is critical, and who shall do what can be specified only in terms of functions. Analysis of objective leads to analysis of ways and means of achievement; analysis of ways and means leads to specifications of facilities and of the *what* and *how* and *when* and *where* of unit acts of execution. Definite responsibilities for definite acts of execution according to the flow of definite instructions must be assumed by the planning function. Otherwise there cannot be planned and coordinated execution, records at each unit point of execution to make certain that execution is as planned, and prompt action to correct imperfect execution where it may occur.

Planning for any enterprise of substantial scope must operate on various planes, each of which has its standards, which must interlock with—be multiples or divisors of—the standards of all other planes. . . . There is strategic planning on the highest plane, tactical planning on intermediate planes, blue-print planning at the level of detailed execution, and individual worker's planning at the individual workplace. It should never be out of mind that, except where a worker is victim of highly mechanized chain operations, he has large discretion within the frame of specifications of quality, quantity, tolerances, suggested methods, standard times, and so on, to plan how he as an individual will handle a particular job.

. . . Within this wide scope of its activity planning helps to plan policy at the one extreme, plans detailed execution at the other extreme, and has a finger on the pulse of actual execution. It is not a completely detached function which receives from top management advice as to objective and instructions to plan and has no concern with execution. But its concern with execution, subsequent to planning the execution, is strictly limited, and planning may do much harm if it reaches so far into the area of execution as to become meddlesome.

Finally, planning requires some basic, ultimate standard to serve as a guide for its own activities and as a criterion by which to judge their quality. This standard is something additional to achievement of the objective of the enterprise; it involves also the manner of achieving it. In industrial private enterprise this controlling standard is profit. Because in simple terms profit represents the difference between selling price and total cost, and the selling price ceiling is determined by the market and not by the enterprise, reduction of cost comes to be substituted for profit as the immediate standard by which the quality of planning is evaluated. In philosophic terms it is conservation of human and material energies.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

Please Print

Name ....
Surname Given names

Home Address .... ☐

Employer ....

Employer's Address .... ☐

(Check address to be used for Institute mail.)

Product or Service ....

Position or Title ....

Degree, Year & College ....

Advise Headquarters Promptly of Changes

Plan to Visit

An interesting corner in Quebec viewed from the Bishop's Palace with the Chateau in the background.

The St. Louis gate, not far from the Chateau

PRELIMINARY PROGRAMME

• WEDNESDAY, MAY 11th

Morning: The Quebec-Chicoutimi Highway.
The Arvida Aluminum Bridge.

The luncheon speaker will deal with the history of Quebec to give visitors an appreciation of the historic places which will be included in Thursday's tour of the city.

Afternoon: Mechanization of Woods Operations.
Paper-Making Machines.
High-Speed Photography.
Television.

The dinner address will be the report of the retiring president.

Evening: The Annual General Meeting.
Lecture—Guided Missiles.

• THURSDAY, MAY 12th

Morning: Forest, Mineral and Water Resources of Quebec.
The First Canadian Jet Airliner.

There will be no speakers at luncheon or dinner and the afternoon will be free for sightseeing, golf, and other diversions.

Evening: Non-technical lecture and demonstration of television. (R.C.A. Laboratories, Princeton, N.J. will provide equipment for a full practical demonstration of television in action.)

• FRIDAY, MAY 13th

A regional conference (Western Hemisphere) of the International Scientific Management Committee will be sponsored on Friday and Saturday by the Canadian Management Council. The Institute is one of eight member bodies of C.M.C. and has assisted the Council in arranging the conference.

Morning: Opening sessions of the Management Conference.
Papers on Hydro-Electric, Chemical Engineering and Community Planning subjects.

Historic Quebec this Spring

The luncheon address will be one of the highlights of the meeting. Dr. Lillian Gilbreth, the eminent American Industrial Engineer will deal with "The Place of Human Engineering in Management". Dr. Gilbreth is becoming widely known as "Mother" in the delightful story "Cheaper by the Dozen".

Afternoon: Panel discussion—"Management—A Trusteeship."

Evening: The Annual Banquet and Ball. The Hon. Maurice Duplessis, Premier of Quebec will be the dinner speaker.

• SATURDAY, MAY 14th

(Second day of the Management Conference).

Morning: Advantages to U.S. Industry of Branch Plants in Canada.
Decentralization of Industry in the Western Hemisphere.

Afternoon: Panel Discussion—"Changing Problems of Management in a Post-Boom Period."

A lookout in Battlefields Park.

MARK THE DATES!

MAY 11-14

● In view of the interesting programme and the limited accommodation, reservations should be made promptly after receipt of registration forms which will be mailed direct to every member.

● Single rooms will be scarce and unaccompanied delegates will be asked to share double rooms. The best way will be for delegates to make their arrangements in advance and indicate these on the reservation form.

● Convention rail fares will be available — round trip tickets from any point in Canada or Newfoundland for one and one-half times the one-way fare (plus twenty-five cents). Trans-Canada Airlines have special rates for groups of ten or more — 160% of the one-way fare.

● Ladies will be welcome at all functions. A ladies' Committee of the Quebec Branch is making additional arrangements of an unusually interesting character.

The well known Quebec Bridge which links the Northern and Southern parts of the Province of Quebec.

From Month to Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Amendments to the By-Laws Proposed by Council

In accordance with Sections 19 and 80 of the by-laws, the Council presents for the consideration of corporate members the following proposal for the amendment of Section 12 and for the introduction of a new Section 30A.

These proposals will in due course be submitted for discussion at the annual general meeting on May 11th, 1949, in Quebec, and will subsequently go out to ballot.

The proposals now submitted were approved by the Council on February 19th, 1949.

Section 12—Fifth line—Eliminate the words:

"The number of Honorary Members shall not exceed twenty."

Proposed New Section 30A

Alternates

In the event of a councillor being unable to attend a specific meeting of Council the executive of the branch may appoint an alternate (other than a councillor) for that meeting only who shall be a member of the branch, such alternate to have all the rights and privileges of the councillor whom he is replacing.

Field Secretary

At the meeting of Council held in Montreal on February 19th it was agreed unanimously that a Field Secretary be appointed as quickly as possible, and that he operate with Toronto as his headquarters.

This is similar to a decision made by Council in 1946. The employment of such a person was one of the reasons for asking for an increase in annual fees at that time. Unfortunately the accelerating costs of doing business used up much of the increased revenue, but the principal reason for not proceeding then was that no suitable candidate applied for the position. Every Member and Junior was circularized in March, 1947, with details of the work but only three applications were received. These were not considered by the Finance Committee as meeting the requirements.

A Field Secretary with an office in Toronto should be able to increase greatly the services of Headquarters to the branches. In Ontario alone there are now twelve branches with prospects of more in the near future; also, such an office could be of special assistance to the Ontario Division.

As soon as he has acquired experience in and knowledge of the Institute he will be able to expand the service to branches in the west and the east. His contacts between Headquarters and branches and between branches should assist materially in the functioning of the branches and the general activities of the Institute.

The problem of finding a suitable man remains the prime consideration. Members who may be interested are invited to so inform Headquarters and further information will be supplied promptly.

Cooperation with A.S.M.E.

Recently the governing bodies of the American Society of Mechanical Engineers and The Engineering Institute of Canada have approved a proposal of the Joint Committee, that members of either society shall be permitted to attend annual meetings of the other on the same basis as if they were members.

In short this means that members of the Institute who are not members of the A.S.M.E. are privileged to register and participate in their meetings just as if they were members, and members of the A.S.M.E. may do likewise for E.I.C. meetings.

Immediately it is apparent that the registration fee for annual meetings which applies to non-members, is not applicable to members of these two organizations.

Probably this will result in more savings for E.I.C. members than for those of A.S.M.E., but it is hoped the arrangement will encourage more members of each organization to attend the meetings of the other.

The proposal was developed and presented by the Joint Committee that is maintained under the terms of the co-operative agreement between the two organizations. This committee meets twice a year — once at each of the annual meetings of the societies. The Institute members are John G. Hall and Dr. O. W. Ellis of Toronto and W. A. Newman and G. N. Martin of Montreal—all members of both societies. The American representatives are, A. E. White, A. G. Christie, J. B. Armitage, T. E. Purcell and C. E. Davies.

Employment of Tuberculous Veterans

The Department of Veterans Affairs has issued an appeal to prospective employes on behalf of cured tuberculous veterans. The *Journal* believes this to be a cause worthy of special attention.

These veterans acquired their infection in the service of their country but they have not had an equal break in the immediate post war rehabilitation. They must try to rehabilitate themselves now, three, four, five or more years later when jobs are not quite so plentiful and competition is keener.

Mass X-rays in recent years have shown that thousands have communicable tuberculosis without being aware of it. The cured tuberculous veteran is not released until he is non-infectious and he is subjected to regular check-ups to guard against relapse. The worker whose T.B. has healed is a better health risk in your plant than the man off the street.

There is no good reason why the veteran with healed tuberculosis should face any employment handicap if he is measured for his job with the same care that any good employer uses in his hiring techniques. Ability, not disability, is the yard stick. *Give him five minutes — he gave you five years.*

Another Engineer Appointed to Ottawa

Mr. Marc Boyer, M.E.I.C., former registrar of the Corporation of Professional Engineers of the province of Quebec has been appointed Deputy Minister of Reconstruction & Supply. Engineers will be particularly gratified by this appointment which follows so closely the appointment of the Minister, the Honourable R. H. Winters, another eminent engineer.

Marc Boyer, M.E.I.C.

The Institute has always contended that the engineer's training directed as it is toward the development of analytical thinking should be a notable asset in high government office. Of the all-too-few engineers who have aspired to, and reached such high office in Canada and elsewhere, most have served with distinction. Mr. Boyer's demonstrated abilities leave little doubt that he will acquit himself well.

Mr. Boyer graduated in civil engineering from Ecole Polytechnique of Montreal in 1928. After graduation he worked for the Quebec Streams Commission and was later engaged in research for Consolidated Mining & Smelting Company at Trail, B.C. In 1930 he joined the Department of Mines in the province of Quebec and in 1943 was appointed commissioner for the Civil Service Commission of the Province. Since 1945 he has been registrar and acting executive-secretary of the Corporation of Professional Engineers of Quebec.

The McCharles Prize for Invention or Research

The University of Toronto has announced that a prize of one thousand dollars has been made available by gift of the late Aeneas McCharles.

The prize will be awarded from time to time as recommendations are received.

(1) to any Canadian from one end of the country to the other, and whether student or not, who invents or discovers any new and improved process for the treatment of Canadian ores or minerals of any kind, after such process has been proved to be of special merit on a practical scale;

(2) or for any important discovery, invention or device by any Canadian that will lessen the dangers and loss of life in connection with the use of electricity in supplying power and light;

(3) or for any marked public distinction achieved by any Canadian in scientific research in any useful practical line.

Candidates must be proposed in writing by some qualified person other than the candidate and supported by a second such person familiar with the circumstances. Sufficient proof must be furnished to satisfy the committee as to the importance of the accomplishment on which the recommendation is based.

Forms for nomination may be obtained from Mr. C. E. Higginbottom, secretary, The McCharles Prize Committee, University of Toronto.

Ontario Association...Annual Meeting

The 1949 Annual Meeting of the Association of Professional Engineers of the Province of Ontario held in Toronto at the Royal York Hotel on Saturday, January 29th, was an outstanding success. The opening luncheon brought out an attendance of about six hundred, which was well rewarded by the address of Colonel F. J. Lyle, O.B.E., director of Trade and Industry Branch, Ontario Department of Planning and Development, on "Canada's Industrial growth and the Resulting Trade Problems."

W. L. Saunders of Ottawa, vice-president of the Engineering Institute, and L. Austin Wright, general secretary, were head table guests, along with others representing several more sister or kindred organizations.

The annual business meeting held in the Ball Room after lunch was also well attended. The reports of the retiring president George L. Macpherson of Sarnia and director T. M. Medland gave a general account of the year's activities and the membership and financing of the Association—all of which were of a very satisfactory nature. It was apparent to everyone that the Association is not only expanding its numbers, but its usefulness as well.

The new president, W. J. W. Reid of Hamilton, spoke briefly at the end of the agenda, expressing his appreciation of the honour done him and asking for the continued interest and support of the membership. The concluding item was the presentation by him of a certificate of life membership to Mr. Macpherson.

Perhaps the most interesting feature of the whole meeting was the question and comment period which followed the address. Many members took part in it—some to praise and of course some to criticize. The most frequently mentioned subject was collective bargaining. Mr. Macpherson explained that it wasn't possible to conclusively answer all the questions because a committee had been appointed to study the subject and the officers were not in a position to commit the Association before the report of the committee had been received and a policy evolved from it.

Other questions and suggestions related to better publicity for the profession, remuneration and employment conditions. All speakers from the floor stated their cases clearly and without rancour, and in fact gave living testimony to the inaccuracy of the too frequently heard comment that the engineers are an inarticulate lot. These discussions were a healthy indication that we enjoy a state of democracy in this Canada of ours, and that the Association is a vital organization making its contribution to that democracy.

The Ontario Association's annual business meeting:—G. L. McPherson, retiring president, makes his report. The incoming president, W. J. W. Reid of Hamilton, is on his right, with Col. T. M. Medland and J. M. Muir, executive director and registrar, respectively, of the Association, on his left.

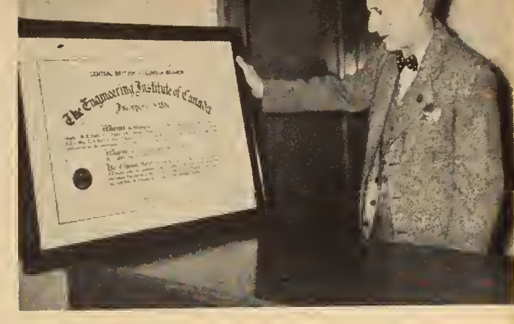
Another Institute Branch Begins Operations

The Central British Columbia Branch was inaugurated as the twenty-ninth branch of the Institute on January 14th at a dinner meeting in Kamloops, B.C. The branch will serve members resident in Osoyoos, Oliver, Penticton, Vernon, Revelstoke, Kamloops, Williams Lake, Quesnel, and Prince George.

The Institute's president Dean J. N. Finlayson of U.B.C. was on hand to present the charter of the new branch to M. L. Wade, provisional chairman. In his address the president outlined the history of engineering societies and associations from the birth of the Institution of Civil Engineers in England in 1818 and emphasized the overall scope of the Engineering Institute in the profession in Canada. In a letter to Headquarters Dean Finlayson said, "The executive of the new branch were exceedingly kind and the whole celebration bore evidence of careful planning. A goodly number of young engineers attended."

The following officers for 1949 were elected at the meeting: William Ramsay and H. L. Hayne of Kamloops, chairman and vice-chairman respectively; M. L. Wade and F. McCallum of Kamloops and A. R. Colby of Penticton, members of the executive committee; H. L. Cairns, Kamloops, secretary-treasurer.

The branch commences operations with 15 members, 8 juniors and 10 other grades on its membership roll and these members have wisely elected to their first executive a group of active and influential engineers whose records indicate enthusiastic support of the Institute in all its aims and activities. The *Journal* congratulates the new C.B.C. branch and expects that forthcoming issues will carry reports of its continuing growth and participation in the affairs of the Institute.



H. L. Cairns, first secretary-treasurer of the new branch, with the charter presented by President Finlayson.

Right (upper). W. E. Warburton on the left with A. F. Paget, G. W. Lake, B. C. Lewall, R. L. Bigg, H. M. Bigwood and C. H. Dunsmore.

(Lower). Left to right—the new chairman and vice-chairman, W. Ramsay and H. L. Hayne, with L. E. Willis, J. H. A. Steven and C. J. L. Sanderson.

Below (left). President Finlayson, M. L. Wade of the new branch executive, and W. Ramsay, the new chairman.

(Centre). From left—A. C. Dimock, D. C. McVicar, J. A. Leslie, J. Conrad, R. G. Harvey, R. S. B. Lillico, and F. W. Runnalls.

(Right). S. H. Blackey, C. W. Jones, T. Lee, E. H. Barclay, A. R. Colby.

First Pan American Engineering Congress

"Engineering in the Service of Peace"

Under this heading the engineers of Brazil are holding an international or North American conference of engineers at Rio de Janeiro on July 15th to 24th, 1949. Invitations to participate are issued to engineers in Canada and the United States and already considerable activity is evident in the United States.

Any members of the Institute who are interested are asked to communicate with Headquarters where there is additional information.

Herewith is the announcement and the invitation as issued by F. Saturnino de Brito, filho, President of Uniao Sulamericana de Associacoes de Engenheiros.

"Engineering in the Americas today needs a 'town meeting' for the expression of its common points of view, for the unification of its plans, for the joint study of the great problems which confront it — problems which relate to the general welfare and to peace among nations — and for the achievement of personal contact and direct links among the engineers of the American community, for which nothing can substitute.

"To achieve these objectives, the South American Union of Engineering Associations (USAI) decided to hold, in cooperation with engineering associations throughout the Americas, the First Pan American Engineering Congress, from July 15 to 24, 1949, in Rio de Janeiro, to be preceded by a meeting of engineers in Sao Paulo from July 9 to 13.

"The technical agenda of the Congress was prepared with the intention of including the principal sectors of engineering, having in view the great service which our profession can render to the Americas.

"The agenda has been made broad, to facilitate the presentation of papers and the objective examination of varied technical subjects. We felt this to be the best way to undertake the study of satisfactory uniformization in professional criteria.

"As the best manner to prepare to deal with the full agenda, we believe that, in addition to efforts to obtain individual papers, reports and recommendations, meetings should be held in each country for previous study of the subjects listed, with the participation of specialists in each of the main fields shown in the agenda. These groups, whose gatherings should be of considerable local and general interest, should prepare reports or recommendations accompanied by brief explanations, which will be submitted to the Congress.

"The period for presentation of papers ends April 30, 1949. This will make possible a sizeable contribution of ideas, papers, reports of achievements and proposals for new steps.

"Let us go forward, Engineers of all the American nations, to better collaboration in perfecting our techniques and in a common effort toward the progress, peace and liberty of the Americas.

"We await you here in Brazil, to greet you in brotherly fellowship."

Following is an abridgment of the agenda:

First Committee: Transportation and Communication — including railway, highway, maritime, river and lake, air tele-communication and postal.

Second Committee: Construction — including foundations, structures, construction.

Third Committee: Power — including hydraulic, fuel, electric.

Fourth Committee: Urban and Rural Engineering — including city planning, urban housing, public utility services, urban traffic, rural engineering.

Fifth Committee: Sanitary Engineering — including water supply, storm water, pollution and self purification of streams, lakes and bathing beaches, sewage, urban systems, disposal of wastes, hospitals and cemeteries, rural sanitation.

Sixth Committee: Industrial Engineering — including metallurgy, mechanical, extractive, processing and chemical industries.

Seventh Committee: Mining Engineering and Geology.

Eighth Committee: Teaching of Engineering.

Ninth Committee: Miscellaneous.

The James Watt International Medal

The Institution of Mechanical Engineers has announced the award of the James Watt International Medal to Dr. Frederik Ljungstrom of Sweden.

The conditions governing the award of the Medal were stated on its foundation to be as follows:

"James Watt was born on 19th January just over two centuries ago. To commemorate an event which was destined to bring about a revolution in the utilization of power the Institution of Mechanical Engineers of Great Britain decided to award every two years a Gold Medal to an engineer of any nationality who is deemed worthy of the highest award the Institution can bestow and that a mechanical engineer can receive. In making the award the Institution has secured the co-operation of the principal engineering institutions and societies in all parts of the world as nominating authorities."

The illustrious company which Mr. Ljungstrom joins includes Sir John Aspinall and Dr. F. W. Lanchester of Britain. Henry Ford and Professor S. Timoshenko of the United States, Dr. A. G. M. Mitchell of Australia and Professor A. Stodola of Switzerland.

Are You a Consulting Engineer?

Frequently Headquarters is asked to supply names or lists of names of consulting engineers to handle a great variety of work in Canada and in other parts of the world as well. Only recently two separate requests were received for names of engineers to design a group of works running into many millions of dollars.

In one way or another a good list has been built up, but it is more than likely that it is not complete. It should be complete.

It is the purpose of this article to invite all Canadian consulting engineers to send Headquarters a list of the kinds of work in which they are interested, so that we may have this information before us when further inquiries are received.

The Institute has been campaigning to have Canadian work designed and built by Canadians. It will be helpful in this campaign if we can have a complete and dependable catalogue of all consulting engineers and the work which they can do.

Canadian Construction Association

Convention Highlights

Attendance for the 31st annual C.C.A. convention at Toronto, January 23rd to 26th, 1949, established an all time record, with close to 900 registrations. This was attributed in large measure to the efforts of the Membership Committee which has brought the membership to a total of 700, double that of ten years ago.

Following registration, the meeting proceeded with presentation of various Committee reports. That apathy towards apprenticeship training posed the most pressing problem ever to face the industry, was stated by J. M. Pigott, C.B.E. of Hamilton, chairman of the Apprenticeship Committee. The industry was faced with the duty of setting aside methods that have proved inadequate to meet the shortage of tradesmen and of planning a new approach. "We must draw in five times as many boys as we have now, and train them more efficiently," he said.

General Manager R. G. Johnson briefly reported on the Association's activities during the past year, calling attention to the widely expanded information service now available to the membership. He announced that for the 1950 convention, to be held January 15th to 18th, 1950, the Mount Royal Hotel, Montreal, had been chosen.

At the first luncheon meeting Allan C. Ross, president of the Association, presented his annual report. He predicted that while it would be improper to forecast any substantial drop in costs for 1949, there was reason for hope that if inflationary factors are restrained, the cost rise may be halted by year's end. The anti-inflation programme mapped out at the last annual meeting, he said, could be credited for improvement in conditions during the past year, which showed a reduction in the rate of rise in costs from a 20 per cent increase in 1947 to a 10 per cent increase in 1948.

At the annual banquet, a welcome was extended to the Members by G. S. Welsh, Minister of Planning & Development, speaking on behalf of Premier T. L. Kennedy. The guest speaker was the Honourable R. H. Winters, newly appointed Minister of Reconstruction and Supply. Briefly reviewing gains over recent years in private investment in Canada, he predicted a pronounced swing in 1949 from industrial expansion to public utility construction, institutional buildings, and government projects. It is in the years beyond 1949, he pointed out, that public investment may have to play a more important part than in the past four years. Mr. Winters expressed the view that if all governments work together on a common goal, something could be done to help the industry avoid some of the excesses of booms and depressions, and contribute to greater stability of the Canadian economy. The federal "shelf" of public projects alone had reached a total of over $100 millions, he said, and he wanted to see it grow to $300 millions. He called on provinces and municipalities to build up their proportion to bring the combined total to over a billion dollars.

Second day addresses included H. J. Carmichael, chairman of the Industrial Defence Board, and D. B. Mansur, president of the Central Mortgage and Housing Corporation. Mr. Carmichael gave an outline of the skeleton organization being quietly set up now to deal with production for war should the necessity arise. Discussing the immediate need for housing, Mr. Mansur observed that we have just managed to look after current needs in Canada, without reducing the backlog of need accumulated during the war and since, yet no other country can show better per capita house production.

The Hon. Anthony Eden attended and addressed the meeting of the C.C.A. He is shown here with his aide, Commander Noble and Mr. Allan Ross, C.C.A. president, on his right. On his left are Albert Deschamps and Robert Drummond.

At the luncheon meeting, the second day, the guests were briefly addressed by the Honourable Anthony Eden, who was passing through Toronto. The luncheon guest speaker was Mr. A. C. Clark, chief of the Construction Division of the Public Roads Administration at Washington. In view of the growing importance of the Road Builders Section of the Association, and of their interest in the anticipated cooperation between Dominion and Provinces for completion of the Trans-Canada Highway, his outline of the excellent results obtained in building highways in the United States through cooperation between federal authorities and the various states was timely and constructive.

Speakers for the third day sessions included Past President Albert Deschamps, O.B.E.; R. F. Legget, director of building research, National Research Council; and F. K. Ashbaugh, Dominion steel controller.

On the lighter side, entertainment included attendance at the Royal Alexandra theatre, where a New York Cast showed a musical comedy production, " High Button Shoes ", and a Buffet Supper, under the auspices of the Toronto Builders Exchange, combined with a Robert Simpson Co. Fashion Show, and dancing. Entertainment of ladies included a trip to Niagara Falls.

Quebec Association Report on Minimum Salaries

The Corporation of Professional Engineers of Quebec has recently issued a report submitted by C. E. Gelinas, chairman of the Committee on Remuneration of Engineers. This report presents a proposed schedule of minimum salaries for engineers in the employee class, based on results of the survey carried out by the committee, as authorized by council in March, 1948.

The objectives of the survey were, to develop a schedule of minimum salaries suitable for adoption as part of the official code of the corporation; for employers as a practical method for determining minimum remuneration consistent with requirements and conditions of employment; for employees as an adequate standard of compensation commensurate with the obligations of any engineering classification; and for the entire profession as a logical basis for recognition of uniformly high standards of qualifications and remuneration.

Grade	Duties and Qualifications	Basis of Determination	EVALUATION						Salary in Dollars per Month		
			Education		Experience		Resp.†	Total			
			Degree	Points	Years	Points	Points	Points	Min.	Act.	Rec.
I	Technical work. Qualification: Univ. graduation. No previous experience.	Average Minimum	B.Eng.	160	0	0	—8	152	210		
		Average Actual	"	160	2	10	—8	162		219	
		Recommended Min.	"	200	0	0	—8	192			263
II	Technical work. Univ. degree. 2 yrs. applicable experience.	Average Minimum	"	160	2	20	4	184	253		
		Average Actual	"	160	4	30	4	194		268	
		Recommended Min.	"	200	2	20	4	224			307
III	Technical work. Univ. degree. 4 yrs. applicable experience. Authority over 1 or more assistants.	Average Minimum	"	160	4	40	16	216	294		
		Average Actual	"	160	12	80	16	256		351	
		Recommended Min.	"	200	4	40	16	256			351
IV	Technical work. Univ. degree. 6 yrs. applicable experience. Authority over smallest organiz. group of technical employees.	Average Minimum	"	160	7	70	32	262	364		
		Average Actual	"	160	15	110	32	302		406	
		Recommended Min.	"	200	6	60	32	292			400
V	Supervisory authority over more than one group of tech. employees with univ. degree and 9 yrs. applicable experience.	Average Minimum	"	160	10	100	64	324	443		
		Average Actual	"	160	17	120	48	328		450	
		Recommended Min.	"	200	9	90	64	354			485
VI	Supervisory and administrative authority over more than one sect. tech. employees with univ. degree and 13 yrs. applicable experience.	Average Minimum	"	160	13	130	128	418	563		
		Average Actual	"	160	19	145	96	401		536	
		Recommended Min.	"	200	13	130	128	458			628
VII	Administrative and executive authority over more than one section of tech. employees with univ. degree and 17 yrs. applicable experience.	Average Minimum	"	160	17	170	256	586	799		
		Average Actual	"	160	24	165	192	517		706	
		Recommended Min.	"	200	17	170	256	626			859
VIII	Executive authority over more than one department of tech. employees with univ. degree and at least 21 yrs. applicable experience.	Average Minimum	"	160	20	200	512	872	*1,195		
		Average Actual	"	160	25	185	384	729		1,002	
		Recommended Min.	"	200	21	210	512	922			1,263

*Not observed — Obtained by extrapolation.

†As determined for Category A—Professional Work. Evaluation points for B—semi-professional and C—non-professional work in Grades III to VIII are 75 per cent of Values for A. Points shown in table for Resp. opposite average actual opposite grades V to VIII are for categories B and C.

Out of a total of 96 organizations approached, data from 71 were analysed, covering 480 classifications. Of 3200 questionnaires sent out to the Corporation's membership, 1670 replies were received, of which 1150 were analysed. The entire evaluation of results depends on a synthesis of three criteria; education, experience and responsibility.

The accompanying tabulation, developed from rationalization of data from both employers and members, shows the evaluation and comparison of average minimum, average actual, and recommended minimum salaries for eight grades of engineer employees. Valuation points for each of the three criteria mentioned are shown for the standard minimum requirements of each grade. Exhaustive statistical and graphic analyses led to the conclusion that each valuation point merited a rating of $1.37 in monthly salary.

The report comments that the exclusion of engineers who acquire qualification without attending University is not intended; nor is it implied that qualified engineers must be paid according to the schedule, since the employer must benefit from the employees' qualifications. Neither is it suggested that all engineers in any grade must be paid the minimum salary. The latter is merely the figure below which no salary is considered adequate. Recommendations are predicated on the assumption that there is a significant difference in value to an employer between a professional employee and one less qualified.

Only by maintenance of this difference can the higher salaries recommended be justified. The Committee, in submitting their report added a recommendation that steps be taken to lay out a plan for implementation of the report on its acceptance.

A comparison of the minimum salaries as recommended in this report, with minimum current, actual current averages, as well as with C.P.E.Q. recommended minima of 1944 and with A.P.E.O. minima recommended in 1947 are as follows: Present recommendations range 20 percent higher for lower grades, ten percent higher for higher grades, than current minima, they range 20 percent higher and 14 percent higher than current averages for grades I and II, are the same in medium grades, and are higher for grades VI, VII and VII by 17, 21 and 26 percent respectively.

Compared with Quebec 1944 recommendations, they are higher by some 17 percent than lowest three and highest two grades, and slightly lower than three medium grades. Compared with 1947 Ontario recommendations, they correspond closely, except for grade 1 where they exceed Ontario's by 5 percent.

Adoption of the recommended schedule would have the effect of raising 85 to 95 percent of current minimum salaries for grades I and II, of raising roughly half of current salaries for grades III, IV and V, and of raising three quarters of the current minimum salaries in the three highest grades.

News of Other Societies

The **Canadian Electrical Association** plans its 59th annual convention to take place on June 28, 29 and 30, 1949, at Banff Springs Hotel, Banff, Alberta.

The **Chemical Institute of Canada** reminds engineers of the annual chemical conference, in Halifax, May 30 to June 1, 1949.

Advance registration forms are available from C.I.C. head office, 18 Rideau St., Ottawa.

The 1949 Canadian regional conference of the **Illuminating Engineering Society** will be in Toronto, April 28-29.

F. P. Labey of Northern Electric Co. Ltd., 1620 Notre Dame St. West, Montreal, is secretary of the Montreal Section of the Society.

A. B. Dove, M.E.I.C., of Montreal, a director of the **Wire Association,** advises that this worldwide organization will hold its first Canadian regional meeting in Montreal, April 28-29, at the Mount Royal Hotel. Information may be obtained from Mr. Dove, at the Steel Company of Canada Limited, P.O. Box 460, Montreal.

The eastern district branch of the **Association of Professional Engineers of B.C.** held its annual meeting at Kootenay on January 31, 1949. J. H. D. Hargrave was elected chairman of the branch Other members of the council are: vice chairman, A. C. Ridgers, M.E.I.C., of Rossland; J. Atwell and A. Lambert, M.E.I.C., South Slocan; A. Telfer, Rossland; A. G. Dickinson, past chairman; and a new secretary, J. M. Heaps, M.E.I.C.

The Montreal regional conference of the **American Institute of Chemical Engineers,** September 7, 8 and 9, 1949, will devote two days to technical papers. Plant visits to several industries at Shawinigan Falls, Que., have also been arranged.

Members of the Engineering Institute are invited to attend, and the local committee on arrangements includes several E.I.C. members. Its chairman is Dr. H. R. L. Streight, P.O. Box 10, Montreal.

The A.I.Ch.E. schedule of 1949 meetings also includes regional meetings at Los Angeles, Calif., March 6-9, 1949, and at Tulsa, Oklahoma, May 8-12, 1949. The A.I.Ch.E. annual meeting for 1949 will be in Pittsburgh, Pa., at William Penn Hotel, December 4-7.

The 1949 annual meeting of the **Canadian Institute of Mining and Metallurgy** will be in Montreal, April 25-28 at the Windsor Hotel.

The Montreal office of C.I.M.M. is at 811 Drummond Bldg.

Arrangements are now complete for the **American Institute of Electrical Engineers'** Conference on Industrial Application of Electric Tubes. It will take place in Buffalo, April 11-12, 1949, at the Statler Hotel.

A.I.E.E. headquarters are at 33 West 39th St., New York 18, N.Y.

The **American Society of Civil Engineers'** calendar of meetings includes the spring meeting, Oklahoma City, April 20-23, 1949; the summer convention in Mexico City, July 13-15, 1949; the fall meeting at Washington, D.C., November 2-4, 1949; and the annual meeting at New York, January 18-20, 1950.

For the annual spring meeting of the **Society of Naval Architects and Marine Engineers** in San Francisco, Calif., May 12-13, 1949, headquarters will be the Palace Hotel.

For further information write H. M. Wick, American Bureau of Shipping, 45 Broad St., New York 4, N.Y.

The 115th national meeting of the **American Chemical Society** will be held March 28 to April 1, 1949, in San Francisco, at the Fairmount Hotel.

The office of the Society is at 60 East 42nd Street, New York 17, N.Y.

The **American Society of Mechanical Engineers'** schedule of 1949 meetings includes the spring meeting at New London, Conn., May 2-4; the semi-annual meeting, San Francisco, Calif., June 27-30; the fall meeting, Erie, Pa., September 28-30; and the annual meeting, at New York, November 27 to December 2.

The **American Institute of Mining and Metallurgical Engineers** includes in its calendar of 1949 meetings a regional meeting at Neil House, Columbus, Ohio, on September 25-28; and the fall meeting, under the auspices of the Institute of Metals Division of A.I.M.E., in Cleveland, October 17-19. The next annual meeting of A.I.M.E. will be in February, 1950, in New York.

The **Society of Automotive Engineers** has scheduled 1949 national meetings as follows: an aeronautic and air transport meeting and aircraft engineering display, at the Hotel New Yorker, April 11-13; the summer meeting June 5-10, at the French Lick Springs Hotel, French Lick, Ind.; the west coast meeting, August 15-17, at Multnomah Hotel, Portland, Ore.; a tractor meeting at Hotel Schroeder, Milwaukee, Wis., September 13-15; an aeronautical meeting and aircraft engineering display October 5-8, in Los Angeles at the Hotel Biltmore; and a diesel engine meeting on November 1-2 at the Chase Hotel, St. Louis, Mo.

Inquiries will be welcomed by the Society at 29 West 39th St., New York 18, N.Y.

The First International Congress of Civil Engineering will be held in Mexico from April 30 to May 7, 1949. It is convened by the **College of Civil Engineers of Mexico.**

The office of the organizing committee is at Plaza de la Republica 55-606, Mexico, D.F., Mexico.

Correspondence

January 9, 1948.

Dear Mr. Wright:-

Thank you very much for your kind letter of December 28th enclosing Life Membership card.

A lot of water has gone under the bridge since I joined the Institute in 1911 and I have been glad to see the gradual progress made by the Institute and its members. I believe our engineers have done themselves proud through the years and should be encouraged to greater efforts and not discouraged by such appointments of outside engineers as is proposed in the planning of Mount Royal and environs and has occurred in the beautification of Ottawa and the recent appointment of Mr. Glen, rather than an experienced engineer, to the very important post on the International Joint Commission. Maybe such appointments have a great bearing on the flight of our trained men to the United States. They note that when any worth while engineering opportunities occur they are parceled out to outsiders or to persons that are not engineers. That is not as it should be.

Again thanking you and wishing you the Compliments of the Season.

J. W. MacMahon, M.E.I.C.

February 10th, 1949

To the Editor,
The Engineering Journal.

Dear Sir:

In the September, 1948, issue of *The Shipping Register and Shipbuilder,* the writer made the following statements, viz:

> The present plans for the improvement of the St. Lawrence Waterway are based upon the knowledge of twenty-five years ago and they should not be proceeded with until the following oversights have been adequately weighed and, if thought wise, provided for. These oversights are:
>
> (1) The designers made no study of the winter temperatures of Lake Ontario and made no effort to use the heat always present in those waters to keep the Waterway free from ice in the winter. Present day evidence indicates that an open channel can be maintained every winter from Lake Ontario to a point well east of Quebec where connection can be established with the Gulf waters, which do not freeze over.
>
> (2) The designers were limited by their instructions to a channel depth of 30 feet. Naturally the St. Lawrence River is adapted to the construction of a much deeper channel and a 50 ft. waterway is easily obtainable from the broad and deep Gulf waters up to Lake Ontario.
>
> (3) The designers purposely neglected the study of the use of Lake Ontario as a storage basin to aid in the development of hydro-electric power, considering such studies to be premature. That position cannot be maintained today. The demand for hydro-electric power is not constant throughout the year, particularly in Canada and the deliberate use of the great lake as a storage basin would make desirable the construction of much larger installations both at Barnhart's Island and at the lower power developments on the waterway, say, in the case of Barnhart's Island an installation of about 3,000,000 hp instead of 2,200,000 hp. as now contemplated.
>
> (4) The designers made no study of the possibility of establishing a joint control over the flow of the St. Lawrence and Ottawa Rivers. The results of such a control would be to increase the hydro-electric power available on the waterway by, say, 500,000 hp. and to render possible an almost perfect control of the flow of the St. Lawrence River between Montreal and Quebec.

In support of the foregoing paragraphs it may be pointed out:

(1) Observations taken in Lake Michigan continuously from November, 1941, to February, 1944, by Prof. Church establish the fact, that, in the deep Great Lakes, the mass of the water is of one temperature from top to bottom during the winter months—that temperature slowly falling to a minimum in the month of March but never falling down to freezing point. From the same observations.

the rates at which the water mass parts with its heat can be determined with an approach to accuracy. If Professor Church's results are compared with those from simultaneous observations made on Lake Ontario by the Dominion Meteorological Bureau it may be concluded that Prof. Church's data may be safely used in water temperature studies in and around Lake Ontario at least until the temperature cycle of Lake Ontario has been studied with as much care as was that of Lake Michigan. Accepting this conclusion, a limit can be set to the time within which the waters of Lake Ontario must flow to reach the salt water of the St. Lawrence Estuary without cooling down sufficiently to permit the formation of ice. Knowing the time limit and the discharge of the river it is a routine matter of hydraulics to design a suitable channel for the river. In midwinter a channel velocity of about 3 m.p.h. will probably be desirable but there must be no still water. Considering how radical a change in the regimen of the river is involved in the above suggestion it might be wise to first develop the upper reach of the river from the Duck Islands to Barnhart Island on the principle of heat conservation and so obtain reliable data for use in the improvement of the lower reaches. The resulting improvement in the power possibilities for Ontario would alone justify the cost of regimenting the upper reaches to provide for an ice-free channel.

(2) Assuming that certain dams that have been recommended for construction have been built, a study of the published plans and charts of the river will disclose the fact that, in the distance of 200 miles between the Duck Islands and Montreal, 146 miles of the channel will require no further deepening to secure a depth of 50 ft. Of the remainder, 35 miles call only for dredging in easy material and only 19 miles will involve the handling of rock and boulders. The engineering profession is not responsible for selecting a 30 ft. depth for a channel which is naturally suitable for 50 ft. navigation.

The water levels and tide records between Montreal and Ile aux Coudres were carefully investigated for the Department of Public Works by R. Steckel, M.E.I.C., about 1890. If these are studied it will be seen that during high water stages a channel approaching 50 ft. in depth already exists between Montreal and Three Rivers. To perpetuate that condition it is only necessary to maintain spring water levels and this can be done partly by improving the regulation of the flow of the river as later discussed and partly by building a dam in the neighbourhood of Ile aux Coudres. The slopes as shown in Mr. Steckel's records will be found to be suitable for a regulated river flowing in a designed channel. In other words the St. Lawrence River between Three Rivers and Ile aux Coudres can be converted into a fresh water stream flowing always full with water levels corresponding closely to present high water marks. The channel depth below Three Rivers will generally be greater than 50 ft.

(3) & (4) These two paragraphs may well be discussed together. The Ottawa River is a turbulent stream with few natural storage basins. Nature however has been very generous in providing storages on the St. Lawrence and these can be used to aid in more fully utilizing economically the flood waters of the Ottawa River. From a study of the discharge records of the latter it will be seen that it lends itself rather well to regulation in two time periods, a high water period of four months and a low water period of eight months. If the power plants on the Ottawa are designed to utilize the regulated high water flow then during those four months the flow of the St. Lawrence can be sharply cut back at Barnhart Island and the surplus waters can be stored in Lake Ontario to increase the flow of the river during the other eight months. On this basis it would be proper to design the power plant at Barnhart Island for a flow of 300,000 c.f.s. of which 200,000 c.f.s. would be held under Ontario title. The power plants at Beauharnois and Montreal would benefit in like amount. But one precaution is necessary in the carrying out of the plan. The water level of Lake Ontario must be drawn down to an established minimum — say about 243 — at the end of every water year which comes about March 31st. With this precaution the choked off flow of the river can be safely held without a fluctuation of water levels in Lake Ontario of more than four feet and without danger of high water flooding.

At present the flow of the St. Lawrence River above Sorel varies from about 180,000 c.f.s. to 510,000 c.f.s. (monthly mean flow) but with the regulation suggested above the limits of flow should be 275,000 c.f.s. and 350,000 c.f.s. a reduction in the amplitude of the variation in flow of about 75 per cent.

The above comments are of course all too brief to develop the problems under discussion but they appear to justify certain pertinent questions:

(i) Why is it proposed to build a 27½ ft. waterway in a location where a 50 ft. waterway can be secured at relatively little added expense.

This is but to repeat the mistake made by the Canadian Government in the 1870's when it decided to build the St. Lawrence Canals, without provision for future growth.

(ii) Why has the possibility of keeping the waterway channel free from ice for twelve months in the year not been fully explored.

(iii) Why should the storage capacity of Lake Ontario not be used to give Ontario an additional power supply approaching 1,000,000 hp. and Quebec an addition of 1,250,000 hp.

Lastly it may be asked why the St. Lawrence waterway should be considered as necessarily an international project. 85 per cent of the power to be developed on it will be for Canadian use. It is estimated that 85 per cent of the freight traffic on it will come from Canadian sources and 85 per cent of the shore line that will be affected by the proposed improvements is held under Canadian title. Surely there is a strong case for an all-Canadian construction — the federal government being backed up by the wealthy Provinces of Quebec and Ontario because of the great stores of hydro-electric power which will become available to them. Full privilege of use can be granted to our American friends in partial return for the privileges extended to Canadian vessels in the Panama Canal, a courtesy which should never be overlooked.

The writer would welcome opportunity to defend his opinions at greater length than the columns of the *Journal* permit but it is not suggested he has fully explored the problems that are dealt with herein. He has only intended to invite others to do so.

J. G. G. Kerry, M.E.I.C.

Personals

Notes of the Personal Activities of Members of the Institute

J. C. Davis, M.E.I.C., of St. Boniface, Man., was appointed senator in January when it was announced the former president of the Manitoba Liberal Association would represent Manitoba in the Upper House when parliament opened.

Senator Davis is president and general manager of J. C. Davis Ltd., Winnipeg engineering firm, and is on the directorates of several other companies. During the war years, he served on the advisory board of the Department of War Services. He is a Graduate of McGill University, Montreal.

W. J. Tindale, M.E.I.C., retired at the end of 1948 as chief engineer of the West Kootenay Power and Light Company, Limited, Trail, B.C.

Mr. Tindale, who contributed to the Institute's Annual Meeting in 1948 the paper on the Power Development on the Kootenay River, has completed 24 years of service with the Company.

As designing engineer he was intimately associated with all developments of the power company between 1926 and 1938. From 1938 to 1940 came the extension of the Upper Bonnington plant, followed in 1942 by construction of the Brilliant plant. Prior to commencement of the Bonnington plant, Mr. Tindale was given the appointment as the power company's chief engineer.

G. L. Macpherson, M.E.I.C., has been appointed general manager of refineries for Imperial Oil Ltd. A graduate of the University of Toronto, he joined the Company in 1922 as a draughtsman. In 1937 he was appointed assistant chief engineer and in 1943 chief engineer. He was later named manager of the engineering and development division, the post he held until his recent appointment.

I. R. Tait, M.E.I.C.

He is the immediate past-president of the Association of Professional Engineers of Ontario, and is E.I.C. Councillor representing the Sarnia Branch.

Louis Trudel, M.E.I.C.

K. R. Swinton, M.E.I.C.

Louis Trudel, M.E.I.C., was appointed in February to the position of assistant manager of the public relations and advertising department of the Shawinigan Water and Power Company, Montreal. He will continue to act as manager and editor of *The Shawinigan Journal,* which position he accepted in 1947, leaving E.I.C. Headquarters after eight years of service as assistant general secretary.

Before coming to the Institute in 1939 Mr. Trudel, a graduate of Ecole Polytechnique, Montreal, had been associated consecutively with the Provincial Electricity Board, the Southern Canada Power Company and Marine Industries Ltd.

Lt. Col. K. R. Swinton, M.E.I.C., former assistant director of electrical and communications design with the Department of National Defence and manager of the electronics division of the R.C.A Victor Company Limited, Montreal, has been appointed vice-president and executive assistant to the president of Imperial Typewriters of Canada, Rotaprint Company of Canada, Limited, and Ritchie Office Equipment Limited, Montreal.

R. Bowering, M.E.I.C.

Col. Swinton, who holds an M.Sc. degree in radio and television engineering, will be in charge of the new electronics division of the Organization, and will also act as general manager and director of an American subsidiary company which is presently being formed in the United States. His work will include the development and sales of new apparatus, and the direction of all export activities.

R. H. Wallace, M.E.I.C., was re-elected chairman of the Cornwall Branch of the Institute at its recent annual meeting. Mr. Wallace, a graduate of Royal Military College and of McGill University, Montreal, is plant superintendent of Canada Starch Company Ltd., Cardinal, Ont.

Prof. M. L. Baker, M.E.I.C., was elected recently chairman of the Halifax Branch of the Institute. Prof. Baker, who is associate professor of mechanical engineering at Nova Scotia Technical College, Halifax, is also a graduate of that college. Before entering N.S.T.C., he was a machinist. He received a B.Sc degree in mechanical engineering in 1932 and he joined Hillis & Sons Ltd., Halifax, as a sales engineer. A year later he joined the staff of N.S.T.C. as an instructor. He was appointed assistant professor of mechanical engineering in 1938.

A. A. Swinnerton, M.E.I.C., was recently elected chairman of the Ottawa Branch of the Institute.

Mr. Swinnerton studied at University of Toronto, where he graduated in chemical engineering in 1919. He served overseas during World War I, and on his return to Canada in 1917 he worked as a chemist with British Acetones, Toronto, and in 1919 he was appointed assistant chemist in the Department of Mines at Ottawa. In 1921 he was promoted to be chemist in charge of oil shale investigations. He was later transferred to the fuel research laboratories of the Department. He worked on the Dominion Fuel Board, and he is now a chemical engineer in the fuel research laboratories of the Bureau of Mines of the Department of Mines and Resources.

Neil Metcalf, M.E.I.C., has been elected chairman of the Hamilton Branch of the Institute.

Mr. Metcalf, metallurgical engineer of

A. L. Furanna, M.E.I.C.

Burlington Steel Company Hamilton, is a graduate of University of Wales with the degree of B.Sc. He worked at Cardiff, Wales, for a time, and in 1926 was appointed assistant metallurgist for Ford Motor Company at Manchester, England. He went to the United States to the Detroit shops of the Ford Company in 1927, but in 1928 he joined the Treadwell Engineering Company at Easton, Pa., as chief metallurgist. It was in 1936 that he joined Burlington Steel Company Limited.

G. W. Lusby, M.E.I.C., chairman of the Border Cities Branch of the Institute, is an engineer with Ford Motor Company of Canada Ltd., Windsor, Ont. He joined the company in 1927, having been employed previously by the Fraser Brace Company at Gatineau, Que., and by the Canadian International Paper Company at Trois Rivieres, Que. He is a graduate of Nova Scotia Technical College, Halifax, having received a B.Sc. degree in mechanical engineering in 1925.

I. R. Tait, M.E.I.C., recently elected chairman of the Montreal Branch of the Institute, is chief engineer of Canadian Industries Limited, Montreal.

F. F. Walsh, M.E.I.C.

Mr. Tait, a graduate of McGill University, joined C.I.L. in 1915 as an elec-

Max L. Baker, M.E.I.C.

trical engineer. He received his appointment as chief engineer in 1939.

H. P. Lingley, M.E.I.C., is chairman of the Saint John Branch of the Institute.

Mr. Lingley graduated from University of New Brunswick in 1930. He worked for Canadian National Railways for a time, and on the reconstruction of the West Saint John Harbour. He was an engineer inspector on several projects for the Federal Department of Public Works in New Brunswick, and he was appointed a junior engineer in the Department in 1937. He was made an assistant engineer in 1943. He is now an assistant engineer with G. G. Murdoch, Saint John.

A. L. Furanna, M.E.I.C., was recently elected chairman of the London Branch of the Institute.

Mr. Furanna graduated from Queen's University in 1939, and he remained at the University for a year as a demonstrator in electrical engineering. He joined the London Public Utilities Commission then, as assistant to the engineer. In 1943 he went to Sparton of Canada Ltd., London, as an engineer in the instrument division. Mr. Furanna has since returned to the London Public Utilities Commission as an engineer.

Photo by Carey Studio

Neil Metcalf, M.E.I.C.

F. F. Walsh, M.E.I.C., has been elected chairman of the Sarnia Branch of the Institute. Mr. Walsh graduated from University of Toronto in 1940 with the degree of B.A.Sc. in mechanical engineering. He was employed by the Steel Company of Canada, at Hamilton, Ont., until 1943, spending one year on a graduate training course, and two as foreman in the mechanical department. He then went to the Imperial Oil Company, Sarnia, Ont., on a training course in preparation for operations at the Polymer Corporation. At the Polymer Corporation he was for two years technical supervisor of steam and power plant, and he was then appointed utilities engineer. He is now assistant technical controller for the Corporation.

D. C. Holgate, M.E.I.C., of the Sault Structural Steel Co. Ltd., is chairman of the Sault Ste. Marie branch of the Institute.

Mr. Holgate has been with his firm since 1941, and has been engineer in charge of all design and drawing office work for the company. In 1943 and 1944 he was in training with the R.C.A.F. Mr. Holgate transferred to Sault Structural Steel Co. from Dominion Bridge Company, Toronto, where he was for two years a structural steel draughtsman. He had previously worked for a time with the MacKinnon Steel Corporation Ltd., Sherbrooke, Que., after his graduation from McGill University in 1938.

R. Bowering, M.E.I.C., was recently elected chairman of the Victoria Branch of the Institute.

Mr. Bowering received a B.Sc. degree in civil engineering from University of Manitoba in 1938. He received the degree of M.A.Sc. in public health engineering at Toronto University a year later and he went to the Board of Health of British Columbia in 1940 to be public health engineer and chief sanitary inspector. He is now director of the division of public health engineering of the Department of Health of the province.

A. W. McMaster, M.E.I.C., was recently elected library trustee for the city of Westmount, Que. The election by acclamation followed his nomination by the Westmount Municipal Association early in January.

R. A. C. Henry, M.E.I.C., of Montreal, has been elected to the board of directors of Marine Industries Limited, and appointed executive vice-president. Mr. Henry will also be associated with Sorel Industries Limited and other companies of the Marine Industries group.

Paul A. Beique, M.E.I.C., of Montreal, has been elected a member of the board of directors of the Mutual Life Assurance Co. of Canada.

E. T. W. Bailley, M.E.I.C., combustion engineer, Steel Company of Canada, Ltd., at Hamilton, has been elected a director of the Association of Iron and Steel Engineers, Pittsburgh, Pa.

John N. Flood, M.E.I.C., has again been nominated by the Canadian Construction Association to attend the second meeting of the Building, Civil Engineering, and Public Works Committee of the International Labour Organization. The meeting is to be held in Rome, Italy, starting on March 15. Sailing early in March, he plans to return home from Liverpool on the Empress of France on April 12.

Mr. Flood is president of John Flood and Sons Limited, engineers and contractors, Saint John, N.B.

R. A. C. Henry, M.E.I.C.

D. K. Penfold, M.E.I.C., chief engineer in the Water Rights Branch of the Department of Lands of British Columbia, has been named a member of the Public Utilities Commission and the Coal and Petroleum Board of the Province, in Victoria. He was appointed to the staff of the Water Rights Branch in 1928, and was made district engineer at Kelowna in 1931. He continued in that position until 1941 when he was made chief engineer.

Russell E. Potter, M.E.I.C., is terminating his position as city engineer of New Westminster, B.C., to accept the newly created position of executive assistant to the Fraser River Basin Commission. The personnel of the Commission will consist of officials of the Federal and Provincial Governments interested in various phases of the River development. Mr. Potter's job will be to co-ordinate the work of these varying interests.

Graduating in civil engineering from the University of Saskatchewan in 1925, he took a student course with the Allis-Chalmers Manufacturing Company in Milwaukee, Wis. He went to British Columbia in 1929 and spent four years in the consulting engineering office of A. C. R. Yuill. Mr. Potter was then appointed city engineer for Nelson, B.C. In 1939 he moved to New Westminster as city engineer. For two years during the recent war he was on leave of absence to the Air Force doing engineering work on the Northwest Staging Route and Alaska Highway.

C. J. Jeffreys, M.E.I.C., recently resigned his position as chief engineer for Stadler Hurter Co. and has established a private practice in Montreal, as consulting engineer covering industrial and general pulp and paper mill design, renovation and process work.

Mr. Jeffreys attended Willesden and London Polytechnic through scholarships and served five years apprenticeship with the British Thompson Houston Co. before coming to Canada in 1924. He has been connected with the pulp and paper industry on design and development with C. Walmsley Company, Canadian International Paper

Paul Beique, M.E.I.C.

Company, Abitibi Power & Paper Company, Fraser Paper Company, Dominion Engineering, and Ontario Paper Company, previous to taking a position with the late John Stadler, during which period he also served as development engineer with the Powell River Paper Co., B.C.

His services were requested during the war with Allied War Supplies as mechanical engineer in connection with design of chemical and explosive plants. In 1944 he rejoined the late John Stadler and had an interest in the Company now known as Stadler Hurter & Co.

During his association in the pulp and paper industry, he has been engaged as engineer and later chief engineer on a number of new pulp and paper mill projects, renovations, and valuations covering kraft, bleached and unbleached sulphite, dissolving pulp, semi-chemical pulp, newsprint, and wallboard.

A. L. Cole, M.E.I.C., who has been superintendent of power for the Saskatchewan Power Commission, will be acting general manager "pending a permanent appointment" in the new crown company, Saskatchewan Power, which will replace the Commission. The general manager will direct the new company, and will be responsible to the board of directors.

At various times Mr. Cole has been an instrument draughtsman, associate editor of a New York power magazine, and chief engineer with the Regina Light and Power Company. He was also employed in the construction of Ontario power plants. He first came to the Commission in 1937 when he accepted the position of superintendent of the Saskatoon plant. In 1946 he was appointed superintendent of power.

Dr. A. F. Baird, M.E.I.C., of Fredericton, N.B., was elected president of the Association of Professional Engineers of New Brunswick at the annual meeting in Saint John in January. Dr. Baird is professor and dean of applied science, University of New Brunswick.

John P. Mooney, M.E.I.C., was elected vice-president of the Association. Mr. Mooney, who is manager of Mooney Construction Co., Saint John, is a past-councillor of the Engineering Institute. **R. C. Eddy,** M.E.I.C., of Bathurst, N.B., is councillor for the Chatham district; **V. S. Chestnut,** M.E.I.C., is councillor for the Saint John District; and **W. C. MacDonald,** M.E.I.C., of Moncton, councillor for that district.

I. P. Macnab, M.E.I.C., of Halifax, has been elected president of the Association of Professional Engineers of Nova Scotia for 1949. Mr. Macnab, the general manager of the Public Service Commission of Halifax, is also vice-president of the Engineering Institute of Canada **L. D. Hopkins,** M.E.I.C., of Bridgewater, N.S., is vice-president of the Association of Professional Engineers of Nova Scotia. He is with the Acadia Construction Co. Ltd., Bridgewater. Councillors are **G. D. Stanfield,** M.E.I.C., and **J. P. Messervey,** M.E.I.C., for Halifax; and **E. D. Brown,** M.E.I.C., Dingwall, and **F. C. Morrison,** M.E.I.C., New Glasgow.

H. W. Lea, M.E.I.C., who for various periods during the past 25 years has been associated with R. S. and W. S. Lea, consulting engineers, has taken over the practice, which, following the retirement of the late R. S. Lea, M.E.I.C., in 1930, had been carried on by W. S. Lea, M.E.I.C., until his death in 1947.

Mr. Lea has also been associated with the Montreal Sewers Commission and Phillips Electrical Works Limited, and was resident engineer on construction of the Chicoutimi Ocean Terminal. In 1941 he went to Ottawa as chief executive officer of the Wartime Bureau of Technical Personnel. Early in 1942 he succeeded E. M. Little as director of the Bureau and in 1945 was appointed co-ordinator of the Department of Reconstruction and Supply. Eventually Mr. Lea found it necessary to resign from government service to devote sufficient time to his practice as a consulting engineer in Montreal and Ottawa.

John Grieve, M.E.I.C., has been appointed executive secretary of the Canadian Institute of Steel Construction, Toronto.

Coming from Scotland, Mr. Grieve, worked in Canada for the Dominion Bridge Company, Montreal, and went to the United States for the Detroit Graphite Company as vice-president in charge of the New York office. Returning to Canada, he became general industrial manager of Brandram Henderson, but later went to Imperial Varnish and Color Company as sales promotion manager.

Donald C. Beam, M.E.I.C., formerly chief engineer of the Carter Construction Co. Ltd., has been appointed chief engineer of the Canadian Institute of Steel Construction, Toronto.

Mr. Beam joined the Carter Construction Company in 1945. He had previously been associated with construction in the Toronto Department of Buildings, which he joined as structural engineer and plan examiner. For three years he was technical secretary to the Joint Committee on Revision to Toronto Building By-Law. In 1941 his services were loaned to Wartime Housing Ltd., as general superintendent of construction. He was later named manager of the maintenance and construction department and he served in that capacity until 1945.

Y. R. Tasse, M.E.I.C., is no longer with the Canadian General Electric Co. Ltd., for whom he was an apparatus engineer at Quebec City. He has become a partner in the consulting engineering firm of Tasse, Sarault et Associés, Quebec.

Mr. Tasse studied at Ecole Polytechnique, graduating in 1935. He joined Canadian General Electric and followed the "test course." He spent some time at the various plants and at the Toronto and Montreal offices, and was transferred to Quebec in 1938. There he opened the apparatus department, of which he was in charge until the formation of the new firm.

G. E. Soroult, M.E.I.C., a partner in the newly established firm, Tasse, Sarault et Associés, of Quebec, has been in consulting practice in that city for the past few years. He is also director of the electrical engineering department at Laval University. The new firm specializes in the electrical, heating and ventilating fields.

Mr. Sarault is a graduate of McGill University, class of 1934. He has been on the staff of Laval University for a number of years. He had worked previously as chief engineer of the C.B.C. radio station C.B.F. in Montreal.

A. Sondilonds, M.E.I.C., has been appointed Winnipeg manager for Automatic Electric (Canada) Limited. He has been associated with the Company since 1940 and has served in the Edmonton and Regina Branches. Since 1945, Mr. Sandilands has been wire and cable sales engineer in the Winnipeg district.

L. M. Hunter, M.E.I.C., engineer for the city of Ottawa, was named assistant commissioner of works by the Board of Control in February. He has been an employee of the engineering department since 1911.

Brigodier Mourice G. Archer, M.E.I.C., of Quebec City, was promoted to that rank in December last and was appointed to command the artillery of the Fourth Canadian Infantry Division of the Canadian Army Reserve Force.

Brig. Archer served in Northwest Europe during the recent war, took command in 1944 of the 4th Medium Regiment, R.C.A., and in 1946 was given command of the 6th Field Regiment, with the rank of lieutenant-colonel. Brig. Archer, in civilian life, is in the consulting engineering firm, Archer & Dufresne, Quebec.

F. J. Hoar, M.E.I.C., of Watertown, N.Y., has been elected to the offices of president and treasurer of the G. D. Jenssen Company, Inc., of that city. Mr. Hoar has been vice-president and general manager since he joined the Company in 1944. He had been associated previously with Stebbins Engineering and Manufacturing Company, Watertown, as middle west representative, and as manager of Canadian Stebbins Engineering and Manufacturing Co. Ltd., Montreal

F. S. MacDonald, M.E.I.C., of Montreal, has been appointed vice-president of the G. D. Jenssen Company Inc., of Watertown, N.Y. Mr. MacDonald has been associated with Homad Services Ltd., Montreal, since 1948, and will continue his association with that Company. He was previously with Sherbrooke Machineries Limited, Sherbrooke, Que.

L. M. Nodeou, M.E.I.C., has been appointed registrar of the Corporation of Professional Engineers of Quebec. Mr. Nadeau has been assistant registrar of the Corporation since 1946. Previously he had been an engineer inspector for Canadian Underwriters Association, Montreal, from the time of his graduation from Ecole Polytechnique, Montreal, in 1936.

F/L. Ion Gillean, M.E.I.C., is in Ottawa, Ont., a signals officer in the R.C.A.F. Maintenance Command. He is an engineering graduate of McGill University, class of 1940. He served with the R.C.A.F. from 1941, taking his discharge in 1945 with the rank of flight lieutenant. He then worked with the Marconi Company in Montreal for several years before rejoining the permanent force recently.

C. E. Cleveland, M.E.I.C., is on the geological staff of the Barnsdale Oil Company, Calgary, Alta., which company he joins after spending a number of years as geologist and exploration engineer with the Bralorne Mines Ltd., of Vancouver, B.C. He received the degree of B.A.Sc. in geology from University of British Columbia in 1934. He received M.Sc. and Ph.D. degrees from McGill University in 1938 and 1940.

J. C. Critchley, M.E.I.C., has accepted employment with Dominion Textiles Co. Ltd., Magog, Que. Mr. Critchley is the former superintendent of Canadian Durex Abrasives, Brantford, Ont.

John Y. Stanfield, M.E.I.C., has accepted a position with the Phoenix Insurance Company of Hartford, Conn. He had been general manager of Londonderry of Canada Limited, at Montreal. A graduate of Nova Scotia Technical College, class of 1933, Mr. Stanfield was overseas with the R.C.A. from 1940-1945, serving with the rank of major.

Thomos A. G. Beeching, M.E.I.C., has accepted a position with the Dominion Water and Power Bureau in Victoria, B.C. He was formerly sales engineer for Brown, Boveri Ltd., Montreal.

Arthur W. Dimond, M.E.I.C., has accepted a position with the Canadian Carborundum Company, Niagara Falls, Ont. He was formerly an engineer with Burgess Battery Company in that city.

A. F. M. M. S. Huda, M.E.I.C., has returned to Pakistan. A graduate of Calcutta University, he received the degree of M.A.Sc. in civil engineering in 1947 from University of Toronto. He was an India Government overseas scholar at Toronto.

D. M. Venton, JR.E.I.C., who was assistant city engineer at Owen Sound, Ont., resigned in January to accept the position of engineer and road superintendent of the Township of East Whitby, Ont. Mr. Venton graduated from University of Toronto in 1945.

D. A. Buhr, JR.E.I.C., is on temporary leave of absence from the P.F.R.A., Regina, Sask., to attend the Utah State Agricultural College where he is working toward a master's degree in civil engineering. Recently he and Howard M. Olson of Sheldon, N. Dak., were jointly awarded the Aluminum Co. of America fellowship to conduct research on aluminum sprinkler irrigation tubing and couplings. Mr. Buhr graduated from University of Saskatchewan in 1947.

Theodore Wildi, JR.E.I.C., has joined the teaching staff of Laval University, Quebec City. He is a graduate of McGill University, where he obtained a B.Eng. degree. He served for a number of years with the Canadian Comstock Company, and for the past five years he has been with the technical group of the Electrical Tamper and Equipment Company of Montreal. At Laval, Mr. Wildi will be in charge of electrical machines and will operate experimental work among the students in the machine laboratories.

Lionel Boulet, JR.E.I.C., has joined the teaching staff of the electrical engineering department of Laval University, where he obtained the degree of B.Sc. in 1944. Mr. Boulet worked with R.C.A. Victor Co., Montreal, for two years, and after studying at the University of Illinois and receiving an M.Sc. degree in 1947, he returned to R.C.A. Victor to work in the electronics laboratories, remaining until his recent appointment.

Williom Hobson, JR.E.I.C., has been appointed manager and district engineer of the Montreal branch office of D. M. Fraser, Ltd., of Toronto, distributors of electrical and mechanical power equipment. Mr. Hobson was formerly employed by the Northern Electric Co Ltd., in the telephone division.

G. L. Porker, JR.E.I.C., has left the employ of Toronto Iron Works Ltd., where he was design engineer since his graduation from the University of Saskatchewan in 1946. He is now a sales engineer with Sarco Canada Ltd., in the White-Rogers electrical controls division, in Toronto.

M. D. Arnaud, S.E.I.C., is with H. G. Acres in Niagara Falls, Ont. He graduated from University of Toronto in 1948 with a B.A.Sc. degree in civil engineering.

Visitors to Headquarters

G. D. Stanfield, M.E.I.C., Starr Manufacturing Works Ltd., Halifax, January 31

G. A. Day, Brown Company, Berlin, New Hampshire, January 31.

Arnold H. Hoffer, JR.E.I.C., General Electric Company, Schenectady, N.Y., February 4.

W. O. Mocloren, M.E.I.C., Brian Colquhoun & Partners, Johannesburg, South Africa, February 9.

W. R. Monock, M.E.I.C., Horton Steel Works Ltd., Fort Erie, Ont., February 10.

W. G. Stuort, M.E.I.C., Yellowknife, N.W.T., February 11.

George S. Sonders, JR.E.I.C., Port Arthur, Ont., February 14.

S/L C. V. Trites, M.E.I.C., Ottawa, Ont., February 17.

S/L J. D. Shonnon, R.C.A.F., Rivers, Man., February 17.

F. Lionel Peckover, JR.E.I.C., National Research Council, Ottawa, Ont., February 22.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Jacques Rabut, HON.M.E.I.C., consulting engineer, of Paris, France, who died on December 1, 1948, was internationally known as an authority on reinforced concrete structure.

M. Rabut, who was head of the firm, Société Ch. Rabut et Cie., in Paris, was made an Honorary Member of the Institute in 1937, at the age of fifty-two. He was also a prominent member of the Société des Ingenieurs Civils de France. M. Rabut studied at the Ecole Nationale des Ponts et Chaussées, Paris, graduating in 1909.

After distinguished service at the front as an engineer officer during World War I, he was sent to the United States with the French High Commission, and later served with a French mission in the United States for the purchase of equipment for the rehabilitation of the devastated regions in France. He then went to China with an international commission assembled by the Chinese Government to deal with the reconstruction of the bridge over the Yellow River. On several other occasions he has been retained by the French Government, notably in connection with a large cold storage plant erected in 1919 at Saint Pierre-Miquelon.

M. Rabut paid a visit to the United States and Canada, in 1934, during which he delivered a series of lectures at the Ecole Polytechnique, Montreal, on French engineering construction, dealing largely with the works with which his firm had been associated as consultants. M. Rabut was one of the French engineers whose remarkable designs in reinforced concrete seemed so daring to engineers accustomed to North American practice in that material. Among such structures may be mentioned two reinforced concrete arch-rib bridges of 330 ft. span over the Meuse, and a number of reinforced concrete airplane hangars of 170 ft. span at Cherbourg and Querqueville.

The death of M. Rabut occurred in Washington, D.C., U.S.A., where he was serving on a French Government mission.

John Brooke, M.E.I.C., of Hervey Junction, Que., died on December 9, 1948.

Very scant information appears in the Institute files relating to Mr. Brooke's career. He was placed on its rolls as an Associate Member in 1899, transferred to Member in 1940, and was granted life membership in 1931.

William Ernest Jenkins, M.E.I.C., of Vancouver, B.C., passed away on February 2nd, 1949. He was president and general manager of Columbia Bitulithic Ltd., Granville Island, Vancouver. He was born at Orwell, P.E.I., in 1884.

On graduating from Queen's University in 1907, Mr. Jenkins joined Bitulithic and Contracting Limited, Winnipeg, and remained until 1915. He was, at first, superintendent in charge of the firm's various contracts in Edmonton. From 1911 he had been general superintendent of work in Calgary and Edmonton. From 1912 he was also a director and the manager of Edmonton Gravel Company Limited.

In 1915 he joined the department of Public Works of Alberta, Highways Branch, with whom he did some work on sand clay mixtures and on tar sands near McMurray. In 1921, he went to Vancouver, B.C., and he has been well known in road and airport construction work in that province also, and as president and general manager of Columbia Bitulithic Ltd.

He joined the Institute in 1907 as a Student, transferring in 1917 to Associate Member, and in 1940 to Member. He was a vice-president of the Canadian Construction Association.

George R. Heckle, M.E.I.C., of Yonkers, N.Y., a consulting engineer with offices in New York City, died in hospital on January 18, 1949.

Mr. Heckle, who was born at Wellesley, Mass., in 1876, graduated from Massachusetts Institute of Technology in 1897. For the next ten years Mr. Heckle worked successively for the Rutland Canadian Railroad, the Baltimore & Ohio Railroad and for T. A. Gillespie Company, contractors, in New York and Pittsburgh. He was construction engineer for the Corrugated Bar Company, of St. Louis, Mo., in 1906-08, working in Missouri, Kansas and Oklahoma. In 1909 he became associated with the engineering firm of Stone & Webster, for whom he laid out electric railway lines in Florida. Later, as vice-president and engineer of the Amberson Hydraulic Construction Company of Canada, he directed several power projects in Canada.

In the first World War Mr. Heckle prepared a number of concrete shipways for the Government at Hog Island, Penn. After the Armistice he opened an office as a consulting engineer in New York. In 1922 he was in Canada again, carrying out hydro-electric developments for the Frederick Loomis Company, and he later established a consulting practice in hydraulic engineering in Montreal, with which he was occupied from 1922-26. He moved his practice to New York City then and did work in U.S.A., Canada, Alaska, and Cuba.

He was a member of the American Society of Civil Engineers, and of the Corporation of Professional Engineers of Quebec. He joined the Engineering Institute as a Member in 1914. He attained life membership in 1947.

James Robertson, M.E.I.C., who died in Vancouver, B.C., on January 22, 1949, was a past-councillor of the Institute Mr. Robertson was born at Kilmarnock, Ayrshire, Scotland, in 1890, and there he served an articled pupilage in engineering.

He was for the past 17 years an engineer in the Dominion Bridge Company's Pacific Division. He was transferred there in 1929 from the Montreal section where he had been an erection engineer. Joining the staff of the Company in 1907, he worked as a draughtsman and checker for a time, and then enrolled to study engineering at McGill University, Montreal, where he graduated with a B.Sc. degree in civil engineering in 1914. Meanwhile his service with the Bridge Company continued during summer vacations.

Mr. Robertson was active in the Institute, serving in 1936 as the Vancouver Branch chairman and in 1939-40 as councillor representing that branch. He had joined the Institute in 1913 as a Student, transferring to Associate Member in 1916 and to Member in 1935. He was also active in fund raising campaigns of the McGill Graudate Society in British Columbia.

John Fraser MacKenzie, M.E.I.C., who was division engineer of the Canadian National Railways at Edmundston, New Brunswick, passed away suddenly at his home on October 18, 1948.

Mr. MacKenzie was born at Fort George, Invernesshire, Scotland, in 1891, He was educated in the old country and coming to Canada as a young man was first employed as rodman and later instrumentman with the Dominion Iron and Steel Company in Sydney, N.S. For the past thirty-four years he had been employed with the Canadian National Railways, entering their service in 1914 at Campbellton, N.B. After enlisting and serving overseas as an officer in the Royal Canadian Artillery during the first World War, he resumed his service with the Railway in Campbellton, as instrumentman, in 1919. He was transferred to Edmundston in 1923 holding the position of senior instrumentman until 1937, when he was appointed roadmaster at Fredericton, N.B., covering the Centreville subdivision of the Edmundston Division. In 1941 he was appointed relieving division engineer serving at Charlottetown, P.E.I., and Edmundston, N.B. In 1942 he was appointed division engineer of the Edmundston Division.

Mr. MacKenzie joined the Institute as a Student in 1914, becoming an Associate Member in 1921 and a Member in 1940. He also held membership in the Association of Professional Engineers of New Brunswick.

A. C. Eddy, M.E.I.C., a life member of the Institute from 1946, died on March 8th, 1948. The *Journal* has received notice of this only recently. Mr. Eddy was chief engineer, of the railway department of the British Columbia Electric Railway, Vancouver, having retired in December 1946 after many years of service with the Company. He had joined the Institute in 1914 as a Member.

James Robert Wood, M.E.I.C., who was Calgary city engineer died on December 31, 1948, at Carstairs, Alta., where he was spending the Christmas season. Mr. Wood had planned to retire shortly.

Born in Scotland in 1888, he attended the Royal Technical College of Glasgow, graduating as an associate in civil engineering in 1911. He worked for a time in the United States, and later for Pacific Mills Ltd., at Ocean Falls, B.C. He was with Imperial Oil Ltd. in the 1920's in Regina. Later he joined the city engineering staff of Vancouver and was designing engineer in the sewer construction branch in 1929, when he received the appointment of assistant city engineer in Calgary. He became city engineer in 1940.

Mr. Wood joined the Institute as an Associate Member in 1919, transferring to Member in 1935.

John Foss Plow, M.E.I.C., former assistant general secretary of the Institute, died on February 3, 1949, after several weeks illness. He was born at St. Albans, Vermont, in 1900.

Mr. Plow's service with the Institute was from 1930 to 1938. He was a graduate of Royal Military College, Kingston, Ont., in 1921, and he studied civil engineering at McGill University. He was vice-president of B. Plow and Co. Ltd., Montreal, until 1925, and he was then with Price Brothers and Co. Ltd., at Riverbend, Que., until 1930. From 1927 he had been assistant to the mechanical superintendent in charge of steam plants and mechanical draughting and design.

Mr. Plow's valuable service to the Institute for eight years was commented on by J. B. Challies, then president of the Institute, who made a presentation to him when he resigned in 1938 from the office of assistant general secretary. He had accepted a position with Charles Warnock and Company, Limited, Montreal, inspection and testing engineers, and after service in the recent war, on demobilization in 1945 he returned to the Company. He was its treasurer and manager at the time of his death.

He had joined the 7th Field Battery on graduation from R.M.C., and also served in the 66th Field before being promoted captain in 1931. He was promoted major and appointed in 1934 to command the 1st Medium Battery, 2nd Montreal Regiment, R.C.A., and shortly after the outbreak of war he was appointed to command the 1st-57th Battery. In 1940 he was posted to second-in-command of the 2nd Medium Regiment. He went overseas, was promoted lieutenant-colonel, and on his return commanded the 51st Heavy Anti-Aircraft Regiment, R.C.A. He subsequently joined the Reserve Force, and returned to civilian work.

Mr. Plow had joined the Institute as a Student in 1921, transferring to Junior in 1928, to Associate Member in 1930, to Member in 1940.

James Addison McCoubrey, M.E.I.C., whose death occurred suddenly at Shaunavon, Sask., on January 31, 1949, was with the Saskatchewan Department of Highways.

Mr. McCoubrey was born in Spain of Scottish parents in 1882 but lived in Scotland until he came to Canada in 1900.

He was first engaged in engineering work on the old "Transcontinental" railroad at Superior Junction. In 1909 he joined the construction department of the Canadian Pacific Railway, with whom he was connected as an engineer on construction projects in Saskatchewan and Alberta until 1932, first as resident engineer and later as an assistant to the chief engineer.

From 1934-36 he was division engineer at Kenora, Ontario, on the Kenora-Fort Frances Highway, and later supervised several construction projects in Northern Ontario and Quebec. In 1945 he returned to Saskatchewan taking up residence in Shaunavon, a town which he helped found in 1913 and which for many years had been his home. During the last several years he was employed as a bridge engineer for the Saskatchewan Department of Highways.

Mr. McCoubrey joined the Institute as an Associate Member in 1924 and became a Member in 1940.

Frank Carl Christie, M.E.I.C., of Regina, Sask., died at his home on February 1, 1949. He was born in Yorkton, Sask., in 1895, and he attended University of Toronto, graduating in 1917 in civil engineering, receiving a B.A.Sc. degree.

Following his graduation, Mr. Christie accepted a position as an engineer with a steel rolling mill in Buffalo, N.Y. After a few months service he went to Fort William, Ont., where he was engaged in the design and construction of terminal grain elevators. He served in the first World War with the Canadian Army, and he returned to Yorkton in 1919. There he wrote his examinations to qualify as a Saskatchewan land surveyor, and formed a surveying partnership. He did surveying work in all parts of the province.

In 1928 Mr. Christie went to Regina and bought the surveying practice of C. S. Cameron. He remained at this work until 1934 when he became business manager of the Concrete Products Company in Regina. In 1938 he was employed by the city of Regina to supervise construction at the municipal airport.

A year later Mr. Christie joined the staff of the provincial department of highways as a resident engineer. He was loaned to the federal department of transport and was in charge of the construction of extensions to the Regina airfield and the construction of the flying training school at Swift Current, Sask.

In 1941, Mr. Christie joined the city of Regina engineering department as an assistant. He was named building inspector for the city in 1946. He was engaged in planning new buildings for the Regina Street Railway at the time of his death. Recently Mr. Christie worked with Dr. E. G. Faludi on a programme of town planning for the city of Regina, and on the revision of the Town Planning by-law. He was to have attended the Ottawa Conference in March on the National Housing Code.

Mr. Christie joined the Institute in 1938 as an Associate Member, transferring to Member in 1940. He was a past president of the Saskatchewan Land Surveyors Association.

Ray Binn Delvin, M.E.I.C., of Montreal, whose death in July 1948 has now come to the attention of the *Journal*, was an electrical engineer with Fraser Brace Limited, Montreal. He had been a Member of the Institute from 1945.

William H. C. Mussen, AFFIL. E.I.C., of Westmount, Que., died on December 15, 1948. He was born in Montreal in 1870.

Mr. Mussen was in business as a supplier of railway, mining and contractors' equipment when he joined the Institute in 1903 as an Affiliate. He later established Mussens Ltd., suppliers of construction equipment, and he was president of the firm until his death.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

March 21st, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate *

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the April meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BALDOCK—DONALD WILLMOTT, of Winnipeg, Man. Born at Brandon, Man., July 11, 1923. Educ.: B.Sc., (Civil), 1945; 1942, rodman, civil aero. divn., Department of Transport; 1943, instru'man., Ducks Unlimited (Canda); 1944-45, Officer, R.C.E.; Northwest Highway System; 1946-47, res. engr., bridge constrn., and at present, design engr. and chief of bridge dept., Winnipeg, Man.

References: W. B. Akerley, G. H. Herriot, G. R. Fanset, E. P. Fetherstonhaugh, N. M. Hall, W. F. Riddell, A. E. Macdonald.

BARCLAY—ERIC HANBURY, of Kamloops, B.C. Born at Kelowna, B.C., Sept. 16, 1901. Educ.: Graduate, R.M.C., 1923; R.P.E., B.C.; Montizambert & Ralston, as follows: 1923-28, transitman, 1928-31, chief of party; with Department of Public Works, British Columbia, as follows: 1944-45, transitman; 1945-46, instru'man. on constrn.; 1946 to date, resident engr., i/c all new road constrn. on Cariboo Highway.

References: H. L. Hayne, J. H. A. Steven, H. L. Cairns, H. C. Anderson, L. F. Grant.

BARTLEY—MELVILLE W., of Port Arthur, Ont. Born at Winnipeg, Man., April 24, 1910. Educ.: B.Sc., Manitoba, 1934; M.A., Ph.D., Toronto, 1936, 1940, respectively; R.P.E., Ontario; Member, C.I.M.M.; with Ontario Dept. of Mines, as follows: 1933-36, (summers); 1936-39, survey party chief, Steep Rock Iron Mines; 1940-41, exploration engr.; 1940-43, chief geologist; 1943-44, chief geologist & production mgr.; 1947 to date, principal, Lakehead Technical Institute, Port Arthur, Ont.

References: J. M. Fleming, S. E. Flook, C. L. Emery, S. T. McCavour, W. E. Mclennan, R. B. Chandler.

BECKETT—HARRY WALLACE, of Trail, B.C. Born at Kinley, Sask., Nov. 5, 1926. Educ.: B.Eng. (Civil), Saskatchewan, 1948; 1945-46-47, (summers), rodman, Dept. of Highways, Sask.; engrg. asst., Dept. of Natural Resources, Sask.; 1948 to date, engr. in training (18 mos. training programme), dftng., survey and shop work, Consolidated Mining & Smelting Co. of Canada, Trail, B.C.

References: A. Baxter, A. L. Garvin, J. P. Svarich, T. W. Lazenby, J. V. Rogers, A. C. Ridgers.

BERNIER—JEAN-YVES, of Hull, Que. Born at Quebec City, May 24, 1918. Educ.: B.A.Sc., Laval, 1941; R.P.E., Quebec 1941-42, asst. engr., Stadacona Mines Ltd., Rouyn, Que.; 1942-45, Lieut., R.C.E., (Canada, U.K., & N.W. Europe); 1945-46, chief engr., Stadacona Mines; Aug. 1946 to Aug. 1948, asst. municipal engr., City of Hull during period Sept. 1947 to April 1948, lecturer in applied maths., Faculty of Applied Science, Ottawa Univ.; at present chief engr., City of Hull, Que.

References: J. P. Carriere, W. J. Foley, F. E. Bronson, A. K. Hay, H. R. Cram.

CAWLEY—JAMES THOMAS, of Fort William, Ont Born at LaRiviere, Man., Nov. 6, 1912. Educ.: B.A.Sc., (Mining), Toronto, 1943; R.P.E., Ontario; 1942, (summer), engr., Falconbridge Nickle Mines: 1943-44, (5 mos.), field engr., Canadian Kellogg Co.; 1944-45, field engr. & supt., M. W. Kellogg, New York; 1945, (3 mos.), design engr., Brompton Pulp & Paper Co.; 1945-48, asst. mine supervisor, Madsen Red Lake Gold Mines; Sept. 1948 to date, Master, Lakehead Technical Institute, Port Arthur, Ont.

References: W. E. Maclennan, G. Eriksen, H. M. Olsson, S. E. Flook, C. L. Emery.

CORKUM—HECTOR MACKENZIE, of Oakwood Corners, Ont. Born at Calgary, Alta., Oct. 9, 1921. Educ.: B.Sc., (Chem Engrg.), 1946; 1944 & 1945, (summers), student processman, British American Oil Co., Calgary, Alta.; 1946-47, field engr., i/c natural gas conservation in Turner Valley area, Petroleum & Natural Gas Conservation Board, Alberta; 1947 to date, process engr., prod. control dept., Polymer Corporation Ltd., Sarnia, Ont.

References: F. F. Walsh, H. G. Foucar, P. M. Reilly, D. H. Welch, P. W. Cochrane

GATOWSKI—STEFAN, of Lowbanks, Ont. Born at Koscian, Poland, Aug. 29, 1912. Educ.: Mech. Engr., Univ. of Warsaw (Politechnika Warszawska), 1938; Member, Assn. Polish Engrs. in Canada; A.M., Inst. Mechanical Engrgs., London; A.Fellow, Royal Aero. Society; R.P.E., Ontario: 1932-34, apprent'ship. railway workshop, Stanistawow; rolling mill and foundry, Huta Bankowe; workshop of machine factory, Warsaw; P.Z.L. airframe and engine factory, Warsaw; 1934, asst. workshop, gov't amm. factory, Warsaw; 1935-36, asst. in labs. foundries gov't. factories, Ursus, Warsaw; with Tools and Machine Tools Factory, Pruszkow, as follows: 1937, designer; 1938, (3 mos.), asst. in workshop; 1938, (6 mos.), chief engr., heat treatment dept.; 1940, 4 mos. i/c final inspecn. dept. of aircraft undercarriage factory, Olaor, Paris, La Couronne; 1940-42, sr. instructor, R.A.F. Tech. School, Blackpool; 1942, (3 mos.), Engrg. Officer in Mtce. Unit; 1942-43, Squadron Engrg. Officer; 1943-45, Chief Station Tech. Officer, etc., Tactical Air Force; 1945, (4 mos.) Tech. Officer, Directorate of Aircraft, Industry H.Q. Polish Air Force; 1945-47, Staff Tech. Officer at H.Q. I Group (Heavy Bombers); 1947-48, Tech. adviser, export office, C. M. Milligan & Clarke, London, Eng.; at present, sr. designer, Atlas Steels, Welland, Ont.

References: J. Pawlikowski, J. Krol, G. H. Krupski, S. Majka.

HATFIELD—HARLEY ROBERT, of Penticton, B.C. Born at Saint John, N.B., Feb. 28, 1905. Educ.: B.A., British Columbia, 1928; R.P.E., B.C.; 1925-28, timekeeper, warehouseman, foreman, sub. contractor, A. B. Palmer Co., Ltd., genl. constrn. (constrn. Fraser Canyon Highway); with B.C. Dept. Public Works, 1928-29, chainman, rodman; 1929-30, supt.; 1930-40, pres. & supt. of constrn., Interior Contracting Co., Ltd.; 1940-41, Sgt., Works & Bldgs., R.C.A.F.; 1941-45, Capt., R.C.E.; 1945 to date, pres. & supt. of constrn., Interior Contracting Co., Ltd., Penticton, B.C.

References: W. G. Swan, A. R. Colby, M. L. Wade, F. McCallum, R. L. Bigg.

HEELEY—FREDERICK STANLEY, of Winnipeg, Man. Born at Manchester, Eng., February 23, 1920. Educ.: Royal Tech. College, Salford, Eng., 1946-47; Holder of Ordinary and Higher National Certificates in Elect. Engrg.; Graduate, Inst. Elect. Engineers, London; with W. H. Smith & Co., elect. engrs., Manchester, Eng.; 1935;-39, apprent'ship.; 1939-40, jr. elect.

engr. and asst. to engr. director, designing and supervising constrn. of indus. elect. plant; 1945-46, R.A.F., instructor in elect. engrg., aero. inspector; 1946-47, asst. engr., supervising constrn. and mtce. of indus. elect. power plant, W. H. Smith & Co.; 1946-47, interval of 10 mos. for course at Royal Tech. College; 1947-48, chief asst. engr., supervising design and constrn. of elect. plant in steel rolling mills, melting shops, etc., W. H. Smith & Co.; 1948, power station control engr., control and mtce., North Eastern Division, British Electricity Authority; at present, elect. engr., engaged on design of power station, elect. instlns., transmission lines, responsible for constrn., erection, etc. of this equipt., genl. engrg. divn., Winnipeg City Hydro Electric System, Winnipeg, Man.

References: H. L. Briggs, T. E. Storey, D. C. Bryden, H. Brekke, R. T. Harland, C. T. Barnes, R. A. Stewart and G. W. Moule.

JAMES—ARTHUR LORNE, Air Vice-Marshal, R.C.A.F., Ottawa, Ont. Born at Montreal, Que., Sept. 17, 1903. Educ.: B.Sc. (Engrg.), McGill, 1924; Assoc. Fellow, Royal Aeronautical Society; with R.C.A.F., as follows: 1924-26, engr. in airworthiness section, 1928-29, i/c section, 1930-32, i/c test flying and experimental operations, 1938-40, i/c of research design, development and mtce., 1944-45, director of aircraft mtce., 1945-47, Air Member for Technical Services, responsible for aero. research, design, develop't., mtce., procurement of all equipt. and supplies, constrn. and mtce. of all aerodromes, bldgs. and facilities, R.C.A.F. Headquarters, Ottawa, Canada.

References: G. R. Turner, A. Ferrier, J. H. Parkin, J J. Green, L. A. Wright.

JAWORSKI—ZYGMUNT JERZY, of Montreal, Que. Born at Harbin, China, April 22, 1902. Educ.: Elect. Engineer, Warsaw Technical Univ., 1935; Member, Assn. Polish Engineers in Canada; (technically qualified for membership in C.P.E.Q., but not yet Canadian citizen); 1929-33, designer of power sub-stations, electric power plant, Company Siemens, Warsaw; Polish Aero. Tech. Institute, Warsaw, 1934-37, engr. in aircraft wireless research dept., 1937-39, chief engr., of dept.; 1939, designer of wireless equipt., Als-Thom Co., Paris, France; 1942-45, engr. in research on electronic control of flight, Bloctube Controls of Canada Ltd., Montreal; 1947 to date, designer of power substation, Quebec Hydro, Montreal, Que.

References: W. E. Cooper, N. L. Hartmann, B. Szczeniowski, J. Pawlikowski, A. Bielinski.

JENIKE—ANDREW WITOLD, of Niagara Falls, Ont. Born at Warsaw, Poland, April 16, 1914. Educ.: M.Sc., (Mech. Engrg., Technical Univ. of Warsaw, 1939; Ph.D., (Engrg.), Univ. of London, 1948; Member, Assn. Polish Engineers in Canada; A.M., Inst. Mechanical Engineers, London; R.P.E., Ontario; with Jenike Bros., Warsaw, 1932-38 (period of 2 yrs.), apprent'ship, 1939, (6 mos.) asst. to technical director, shortly before outbreak of war; 1941-45, chief designer, handling division, Institute of Technical Research, General Staff, Polish Army in U.K.; 1948, (October), to date, develap't. engr., Crane & Hoist Co., Niagara Falls, Ont.

References: C. A. O. Dell, J. W. Jankowski, J. Pawlikowski, J. L. Miller.

KELLY—GERALD FRANCIS, of Quebec, Que. Born at Halifax, N.S. April 23, 1918. Educ.: B.Eng., (Elect.), N.S.T.C., 1943; R.P.E., Quebec; 1939-40, Staff Office Clerk, Intell. Er., H.M. Dockyard, Halifax; 1940-41, 1 yr. asst. to C. P. Roper, civil engr., genl. contracting, specializing in surveying i/c of bldg. 250 houses for Wartime Housing; 1942, (summer) elect. load survey of plant, tests all sizes of motors, etc.; 1943, Sub. Lieut., R.C.N., promoted to Lieut. in 1944; 1944-45, Canadian Liaison Officer to Directorate of Electrical Engrg., British Admiralty, responsible for keeping Canadian Navy informed of all new elect. develop'ts on warships, incl. high and low power, fire control, etc.; 1945-46, Staff Officer, training for Directorate of Naval Elect. Engrg., Ottawa, i/c setting up elect. training for both permanent and reserve forces of R.C.N., incl. complete layout of elect. schools & expediting equipt. for same; March 1946 to date, asst. elect. engr., Quebec Power Co., Quebec, Que.

References: E. D. Gray-Donald, H. F. Beique, L. St. Jacques, L. Swift, P. A. Duchastel, B. O. Baker, J. W. MacNaughton.

LETSON—GORDON MacINTOSH, of Vancouver, B.C. Born at Vancouver, B.C., Oct. 16, 1901. Educ.: B.A., Univ. of London, 1924; B.A.Sc., British Columbia, 1926; R.P.E., British Columbia; part-time apprent'ship. with Letson and Burpee, Ltd., 1924-26, jr. engrg., 1926-28, sales engrg., 1928-34; 1934-35, vice-pres. and manager, Canadian Atlas Diesel Engrg. Ltd.; 1936-39, asst. mgr. and secretary, Letson & Burpee, Ltd.; 1939-46, Active Service; 1945-46, Director of Development of "A" and "B" Vehicles and Small Arms, Dept. of National Defence; at present managing-dir. and vice-pres., Letson & Burpee Limited, Vancouver, B.C.

References: T. V. Berry, P. B. Stroyan, L. B. Stacey, L. G. Trorey, W. O. Scott, E. L. Hartley.

McCAFFARY—PATRICK BERNARD, of Cornwall, Ont. Born at Calgary, Alta., Aug. 31, 1908. Educ.: B.Sc., (Elect. Engrg.), Univ. of Notre Dame, 1933, (acc. ECPD); 1933-39, chief engr., Radio Station CFCN, Calgary, Alta.; 1939-45, Capt., R.C.E., (overseas); 1945-46, jr. engr., Purity Flour Co., Winnipeg; 1946-48, sales engr. and western mgr., Alliance Electric, Winnipeg, Man.; at present, elect. engr., Cornwall divn., Howard Smith Paper Mills Ltd., Cornwall, Ont.

References: H. E. Meadd, W. P. Nesbitt, D. Ross-Ross, A. A. B. McMath, W. H. Malone.

McDONALD—DONALD ALEXANDER JUDGE, of Lachine, Que. Born at Toronto, Ont., Nov. 2, 1913. Educ.: B.A.Sc.; M.A.Sc., (Mining Engrg.), Toronto, 1938 & 1939 respectively; R.P.E., Quebec; 1939-40, engrg. asst., Infrasizers Ltd.; 1940-41, dust control engr., Canadian Johns-Manville Co., Ltd.; with Northern Electric Co., Ltd., Montreal, as follows: 1941-43, jr. engr., mfg. methods, telephone divn., 1943-48, sr. engr., (supervisory), mfg. methods, engrg. dept., 1948 to date, asst. supt., mfg. engrg., test facilities.

References: C. A. Peachey, E. G. Gagnon, E. H. Hayes, J. H. Budden, R. Wilson.

MILNE—W. HAROLD, of Montreal, Que. Born at Northumberland, Eng., Feb. 5, 1898. R.P.E., Quebec; Member, Society of Naval Architects & Marine Engrs., New York.; hull surveyor, Imperial Munitions Board; asst. shipyard mgr., Canadian Allis Chalmers Ltd., Bridgeburg, Ont.; chief dftsman. & asst. naval architect, Wallace Shipyards Ltd., Vancouver (now Burrard Dry Dock Co., Ltd.); design, estimating and repair dept., Canadian Vickers Ltd.; operating mgr., St. John Dry Dock & Shipbldg. Co.; operating mgr., Montreal Dry Docks Ltd.; 1941-43, tech. advisor, Shipbldg. Branch, Dept. of Munitions and Supply, Ottawa; 1936 to date, partner, German & Milne, naval architects and marine surveyors, Montreal, Que.

References: G. Agar, E. G. M. Cape, D. E Carswell, R. E. Chadwick, P. Chevalier, A. Ferguson, O. E. Leger, G. H. Midgley, C. O. Monat, J. Narsted, B. R. Perry, J. W. Simard, F. W. Taylor-Bailey, S. Hogg, R. Yuill.

MORRISON—DAVID RONALD, of Shawinigan Falls, Que. Born at Saskatoon, Sask., April 26, 1921. Educ.: B.Sc., (Chem. Engrg.), Saskatchewan, 1942; Member, Chemical Institute of Canada; 1942-43, chemist, Inspection Board of United Kingdom and Canada, Cherrier, Que.; 1943-46, Subaltern R.C.E.; 1946, (6 mos.), chemical engr., McColl Frontenac Oil Co., Toronto, Ont.; 1946 to date, registered patent agent, patent dept., Shawinigan Chemicals Ltd., Shawinigan Falls, Que.

References: A. F. G. Cadenhead, A. H. Heatley, M. Eaton, H. K. Wyman, C. R. Morris, C. G. deTonnancour.

NICHOLSON—WALTER, of Montreal, Que. Born at South Shields, Eng., Oct. 18, 1904. Educ.: Tech. College, West Hartlepool, Eng., 1920-26; National Certificate in Mech. Engrg. (distinction in design), 1924; with Central Marine Engine Works, West Hartlepool, Eng., 1920-25, indentured apprent. engr., 1925-26, marine engrg., dftsman.; 1926-31, marine engr. officer on vessels owned by Ellerman Hall Line, Prince Line, Cairn Line; 1931-37, engr. surveyor, sole charge of inspecn. and testing of industrial plant (boilers, engines, machinery, pressure vessels, etc.), in power stations, collieries, works plants, North Stafford. area, National Boiler and General Insurance Co., Ltd., Manchester, Eng.; with Lloyd's Register of Shipping, London, Eng., as follows: 1937, engr. surveyor, survey and approval marine engine instlns., all types boilers, pressure vessels (land and marine) ships, etc., 1938-47, on technical staff in London office of Lloyd's, 1947 to date, attached to Montreal office for survey and technical duties as engr. surveyor i/c of approval of machinery plans in Canada, etc.

References: R. E. Heartz, T. R. McLagan, R. K. Thoman, P. F. Stokes, P. W. Gooch, R. C. Flitton, G. Agar.

OSBOURNE—WILLIAM ANDREW, of Waterloo, Ont. Born at Ramelton, Ireland, Oct. 10, 1897. Educ.: B.A.Sc., Toronto, 1924; R.P.E., Ontario; Member, A.S.M.E.; 1917-18, engine instructor, R.A.F., World War I; engr. instructor, D.S.C.R., Toronto; 1920, student mechanic, International Nickel; 1921, student engr., Queenston, power plant constrn., H.E.P.C. of Ontario; with Babcock-Wilcox Goldie-McCulloch, Ltd., Galt, Ont., as follows: 1924-25, student engr., 1925-34, sales engr., 1934-40, sales mgr., 1940-45, works manager, 1945 to date, vice-president and general manager.

References: C. R. Young, J. B. Challies, W. J. W. Reid, N. Metcalf, L. A. Wright.

SHONKWILER—FRANCIS LUCIAN, of Montreal, Que. Born at Monticello, Ill., Aug. 8, 1896. Educ.: B.Sc. (Mech.), Univ. of Illinois (acc. ECPD), 1918; 1918-19, 2nd Lieut., U.S. Coast Artillery Corps; 1919-21, dftsman., Cathage Board & Paper Co., with American Paper Products Co., as follows: 1921-23, mech. supt., 1923-25, purchasing agt.; 1926-30, sales engr., Fulton Engineering Co., Middletown, Ohio; 1930-36, paper drying engr., Midwest-Fulton Machine Co., Dayton, Ohio; 1936 to date, Peacock Brothers Ltd., Montreal, first as sales engr., and at present i/c pulp & paper divn.

References: F. T. Peacock, F. R. McDonald, H. C. Karn, F. O. White, J. M. Jopp.

SIDOROWICZ—ALEXANDER ZBIGNIEW, of Montreal, Que. Born at Bochnia, Poland, June 1, 1912. Educ.: M.Sc., (Mech. Engrg.), Tech. Univ. of Lwow, Lwow, Poland, 1936; vice-pres., Assn. Polish Engrs. in Canada; 1936-39, independent designer, dept. chief's asst., Huta Skoda, Poland (machinery mfg. plant); 1941-42, independent designer, machinery mfg., Ateliers Nevret-Beylier, Grenoble France; 1942-45, Service in British Army; 1945-47, independent designer, cars and engines mfg., Jowett Cars Limited, Bradford, London, Eng.; at present machine designer, Northern Electric Co., Ltd., Montreal, Que.

References: J. Pawlikowski, Z J. Zolkiewicz, M. Winred, W. Golubowski, A. Bielinski.

STEVENS—DONALD REX, of Winnipeg, Man. Born at Calgary, Alta., Dec. 4, 1923. Educ.: B.A.Sc., (Mech.) British Columbia, 1946; 1943-44, (summers), fitter, gun plant, Dominion Bridge Co., Vancouver, B.C.; 1945, Engr. Officer, R.C.N.V.R.; 1946-47, design and shop drawings for own design of bulldozers, brush cutters, overhead loaders, layout for general repair work, estimating for tendering, Bates Electric Welding Ltd., Calgary, Alta.; 1947 to date, genl. engrg. problems from various stores, layout of new elevator and escalator instln. and preparing of contracts with both bldg. contractor and elevator co., supervision of instln., co-ordinating work of various trades with store operation, design and drawing for architectural treatment and control of accounts, supervn. of contrn. and accounts for new store bldg. at Pine Falls, Man., Hudson's Bay Co. and Rupert Island Trading Co., Winnipeg, Man.

References: L. G. Scott, K. H. Bjerring.

WARBURTON—WILLIAM ERIC, of Penticton, B.C. Born at Charlottetown, P.E.I., March 1, 1893. Educ.: McGill Univ., 1912-14; Military Engrg., Oxford Univ., 1915; R.P.E., British Columbia; 1909-10-11-12-13, (summers), rodman, constrn., Elmira Branch, Intercolonial Rly.; rodman, constrn., Plaster Rock, G.T.P.; rodman, levelman, Quebec & Saguenay Rly.; instru'man. i/c concrete plant constrn., Cedar Rapids Power Co., Quebec; 1914, constrn., Long Island Rly., Long Island, N.Y.; 1914-18, Sapper, Lieut., finally Capt., D.E., R.N.D.. (recruited by Institution Civil Engineers, London, Eng.); 1921-22, instru'man., Green Bros. & Burden, Nelson, B.C.; 1923-24, asst. engr., Nelson

Sewer constrn., later chief engr., i/c repairs to Nelson City power plant; 1925, asst. engr., Marpole and Sea Island Bridge constrn; i/c small river protection and drainage works constrn. for own contracts; 1929-30, municipal engr., Municip. of Richmond; 1931-37, in hospital—and during period contracting work for self; 1938, field dftsman., King George Highway; 1939, asst. engr., Alaska Highway; 1940-46, asst. locating engr., Arrow Lakes and Northern Trans-Canada; Commissioned Officer, R.C.E., Pacific Command; 1946-47, own constrn. co., building roads, removing military huts and bldgs.; 1947 to date, city engr., i/c works, waterworks, sewers, elect. distribution, irrigation, flood control, City of Penticton, B.C

References: J. N. Finlayson, A. R. Colby, R. A. Barton, H. L. Hayne, H. L. Cairns, W. Ramsay, M. L. Wade.

WILLIAMS—NEVILLE AUBREY, of Fort Garry, Man. Born at Shannonville, Ont., May 24, 1912. Educ.: B.Sc., (Elect.), Queen's, 1938; R.P.E., Manitoba; 1938-42, electrician, International Nickel Co. of Canada, Copper Cliff, Ont.; 1943, May to Sept., asst. to elect. supt., Aluminum Co. of Canada; 1944, (June to Sept.), supervision of elect. "as fitted" drawings of Current Corvettes, Kingston Shipbuilding Co.; 1942-45, on staff at Queen's Univ. as asst. in maths., demonstrator in elect. engrg. and instructor in R.C.A.F., radio direction finding course; 1945-46, asst. elect. engr., central region Canadian National Railways, Toronto, (motive power and car equipt.); 1946 to date, asst. professor of elect. engrg., Dept. of Elect. Engrg., Univ. of Manitoba.

References: E. P. Fetherstonhaugh, D. S. Ellis, A. E. Macdonald, N. M. Hall, W. F. Riddell, G. H. Herriot.

WISNEY—RICHARD HENRY, of Montreal, Que. Born at Warsaw, Sept. 25, 1919. Educ.: B.Sc., (Mech. Engrg.), Glasgow Univ., 1943; Graduate Member, Inst. of Mech. Engineers, London; 1938-39, apprent., Rotax Ltd., Warsaw; 1942-43, sr. dftsman., Thermotank Ltd., Glasgow; 1943-45, Tech. Officer, R.A.F.; 1945-46, Instructor in Resettlement Corps.; 1946-47, designer, Humphreys & Glasgow Ltd., London, Eng.; 1947-48, designer, (design of bleach plant), Robert A. Rankin & Co., Montreal; at present, lecturer, Dept. of Mechanical Engrg., McGill University, Montreal.

References: R. A. Rankin, E. J. Bartley, H. Schmelzer, R. B. Killam, H. C. Oatway.

FOR TRANSFER FROM THE CLASS OF JUNIOR

BOURGEOIS—PATRICK O., of Montreal. Born at Kenogami on Jan. 28, 1918. Educ.: B.Sc. (Civil) Queen's, 1944; R.P.E. Que.; 1944, Royal Can. Engrs.; with International Water Supply Ltd. as follows: 1945-46, field engr.; 1946 to date, district mgr., i/c Mtl. office, which covers the work in eastern Canada. (St. 1943, Jr. 1945)

References: T. L. McManamna, R. S. Charles, F. B. Booz, P. E. Dufresne, M. Gilbert.

BROOKS—JOHN ALFRED, of Shawinigan, Que. Born at Sarnia, Ont., on Aug. 9, 1920. Educ.: B.Sc. (Chem. Engrg.) Queen's, 1942; 1942-43, chemist, guncotton lab., foreman of cordite lab., special analysis & investigations, D.I.L.; with Can. Resins & Chemicals Ltd. as follows: 1943, shift supervr. i/c operations; April 1945, asst. supervr. resin plant; July, 1945, supervr. of Manomer plant operation & refrigeration; 1946, asst. to engr., i/c checking equipt., installns. & material on chemical plant constrn.; 1947, chief supervr. Manomer plants; 1948, division supervr. i/c all matters related to resins & chemical div. Shawinigan Falls. (Jr. 1945)

References: J.C. Hamilton, R. W. Fugler, C. C. deTonnancour, G. Campbell, J. S. Whyte, C. T. M. Robinson.

HAWKEYE—MICHAEL, of Vancouver. Born at Limerick, Sask., on Sept. 14, 1919. Educ.: B.Sc. (Mech.) Sask. 1944; R.P.E. Alta.; summers, 1940, chainman, Dept. of Transport, Sask.; 1941, rodman, Weyburn, Sask.; 1942, rodman, Edmonton; 1943, rodman, U.S. Public Roads Adminstrn., Ft. St. John, B.C.; 1942-44 (part time) instructor, Univ. of Sask.; 1944-46, Lieut., R.C.E. M.E. Cdn. army; 1946-48, electr. instructor, Can. Vocational Training, Edmonton; 1948 to date, engr., design, layout of heating, ventilating, plumbing, elect. services for bldgs., D. W. Thomson, Consultg. Mech. Engr. and E. A. Simpson Consultg. Elect. Engr. Vancouver. (St. 1943, Jr. 1946)

References: N. B. Hutcheon, E. K. Phillips, W. A. Friebel, J. G. Dale, I. M. Fraser.

HOPKINS—ALFRED of Toronto. Born at Bishop's Falls, Nfld. on April 2, 1914. Educ.: B.Eng. (Elec.) N.S.T.C., 1936; R.P.E. Ont. with Can. Westinghouse Co., Hamilton as follows: 1936-38, engrg. apprentice, 1938-40, switchboards, dftg. & design; 1940-41, design of elect. equipt., Mercury Arc Rectifiers; supervision of installn. of rectifiers, transformers, control equipt. at Shawinigan Falls, La Tuque, Beauharnois; installn. of control at Shipshaw Generating Station; 1943-44, rectifier substations, apparatus service engr. Toronto; 1944-45, Elec. Lieut. overseer, R.C.N.V.R. Liverpool N.S.; at present, apparatus service engr. Toronto service dept., C. W. Co Ltd. (St. 1937, Jr., 1942)

References: J. T. Thwaites, L. C. Sentance, H. E. Cooch, E. E. Orlando, G. G. M. Eastwood.

LOVE—JOHN GORDON of Baie Comeau, Que. Born at Toronto on Nov. 14, 1920. Educ.: B.A.Sc. (Civil) Toronto, 1943; R.P.E. Ont.; summers, dftsman & asst. engr. Peterborough Utilities Com.; 1942, student testing engr. H.E.P.C. Ont.; 1943-46, Lieut. R.C.E.; 1946-47, demonstrator, research asst., dept. of Civil Engrg. (Municipal & Structure) Univ. of Toronto; 1947, asst. field engr., supervn. of constrn. mill extension, Baie Comeau plant, The Ontario Paper Co. Ltd.; 1947 to date, field & design engr. Que. North Shore Paper Co. (St. 1941, Jr., 1946)

References: R. F. Legget, J. F. McInnis, W. L. Sagar, J. M. Pope, S. J. Simons, C. E. Helwig.

MADILL—FLOYD ALEXANDER of Edmonton, Alta. Born on Oct. 12, 1914. Educ.: B.Sc. (Civil) Alberta, 1940; R.P.E. Alta. summers, 1935-39, instru'man, Dept. of Mines & Resources; 1940-45, party chief, Gravity Meter; 1945-46, Seismograph computer; 1946 to date, construction engr., Imperial Pipe Line Co. Ltd., Edmonton. (St. 1940, Jr., 1942)

References: H. A. Ripley, N. A. Lawrence, F. McPherson, I. F. Morrison

MATHIESON—JOHN RICHARD of Toronto. Born at Winnipeg on June 26, 1909. Educ.: B.Sc. (Civil) Man., 1936; R.P.E. Ont.; summers with C.P.R., 1927, 29, 31-36, instru'man, rodman; 1936-38, dftsman, designer, field engr., term. grain elevators, Feed Mills, C. D. Howe Co. Ltd.; 1938, Dept. Public Works, asst. engr., design, specfns., supervn., dredging, wharves, breakwaters; 1940, leave from Dept. P.W., (war service) civilian, asst. engr. i/c constrn. of Br. Commonwealth Air Training Plan Schools, Roads, Water Supply; 1941, Military, R.C.A.F. Canada, overseas, survey officer; 1945, R.C.E. Off. (A) i/c constrn. staff, overseas; at present, engr. grade 3 B. Toronto district office, D.P.W. (St. 1935, Jr., 1937)

References: W. E. Plummer, G. H. Burbridge, H. M. Olsson, A. J. Mickelson.

MILLMAN—ROBERT NOVERRE of St. Catharines, Ont. Born at Toyohashi, Japan, May 8, 1918. Educ.: B.Sc. (Mech.), Sask., 1940; R.P.E. Ont.; 1940 (2 mos.) asst. machine shop; engr. office dftg. mtce. on vacuum system, Dunlop Tire & Rubber Co. Ltd. Toronto; 1940-43, design. dftg. waterworks systems, sewage disposal plants, Gore & Storrie, Consultg. Engrs.; 1943-45, Lieut. Royal Cdn. Navy Volunteer Reserve, design, estimates, specfns. wharf constrn. railway sidings for Naval Bases in Canada, Newfoundland; 1945-46, water softening plant, N. York Twp., waterworks pumping station & intake, Kamloops, B.C., Gore & Storrie; 1946, design, work on veterans Land Act Projects in Ont., (sewer & water) H. S. Philips & Co., Consultg. Engrs.; 1946 to date, with Ontario Paper Co., Thorold as follows: (4 mos.) resident engr., mill constrn. Baie Comeau; (2 mos.) wharf, sewage disposal constrn. work Heron Bay, Ont.; at present, civil engr., Central Engrg. Dept. (Jr., 1944)

References: I. M. Fraser, N. B. Hutcheon, W. Storrie, M. H. Jones, C. Miller, C. F. Morrison.

MONTGOMERY—MORTIMER ANDREW of Kitchener, Ont. Born at Prince Albert on Sept. 1, 1911. Educ.: B.Sc. (Mech.) Sask., 1934; R.P.E. Ont.; summer, 1935, geological survey, Northern Ont.; 1935-37, sales engr. Sarco Canada Ltd.; 1937-42, sales engr. Cdn. Blower & Forge Co. Ltd., Mtl. office; 1942-45, Engr. Officer, R.C.N.V.R., Directorate of Naval Constrn., Ottawa; 1945-49, sales dept. engr. Cdn. Blower & Forge Co. Ltd. Kitchener (Jr., 1938)

References: H. W. Rogers, L. Kiebser, B. Evans, I. S. Patterson, L. C. Sentance.

MONTI—THOMAS ATTILIO, of Montreal. Born at Venice, Italy, on March 8, 1917. Educ.: B.A.Sc. (Civil), Ecole Polytechnique, 1941; R.P.E., Que.; 1941-43, mech. designer, Dom. Bridge Co.; 1943-44, asst. mgr. Colonial Industries Ltd.; 1944-47, consultant, Standard Mach. Shop; Frontenac Mach. Shop; Terrebonne Foundry; Victory Radiator Co.; 1944-49, asst. prof. Ecole Poly.; 1947-1949, regional representative, Nat. Research Council; 1949, resident engr., Can. Inst. of Steel Construction. (St. 1938, Jr. 1946)

References: J. Beauchemin, I. Brouillette, R. S. Eadie, E. M. VanKoughnet, L. Trudel, R. Frigon, J. B. Stirling.

READ—FREDERICK CYRIL, of Halifax. Born at Cobalt on Aug. 1, 1914. Educ.: B.A.Sc. (Chem. Engrg.), Toronto, 1939; Hollinger Cons. Gold Mines; Timmins, Ont.; summers, 1936, 37, 38, labour, Ore Dressing Lab.; 1939-40, tech. asst., Marks & Clerk Patent Attorneys, Ottawa; 1940-41, sulphite pulp grading, Spruce Falls Power & Paper Co.; with Dominion Tar & Chem. Co.; 1941-42, Mtl. labs.; 1942-43, asst. works mgr. Toronto plant; 1943-44, asst. works mgr., Sydney, N.S., plant; 1944-45, Toronto plant i/c of control labs.; 1945-46, factory mgr., Poole Adhesives Ltd., London, Ont.; 1946 to date, associ. chem. engr., Atlantic Fisheries Experimental Station, Fisheries Research Board of Canada. (Sr. 1938, Jr. 1942)

References: O. Holden, W. M. Hogg, C. R. Young, R. A. Rule, J. W. Graeb, A. L. Wood.

ROTHSCHILD—KURT, of Montreal. Born at Cologne on Dec. 6, 1920. Educ.: B.Sc. (Elec.), Queen's, 1946; R.P.E., Que.; summers, 1942 and 43, Electrolier Mfg. Co.; 1944, dftsman. Bedard Girard Ltd., c/o Davie Shipbuilding Ltd., Lauzon, Que.; 1945, dftsman. Halifax Shipyards Ltd.; 1946-49, project engr. i/c elect. instaln. contracts, shipbuilding, industrial, commercial constrn. mfgrg. control switchboards, Bedard-Girard Ltd., Mtl. (St. 1946, Jr. 1948)

References: R. S. Eadie, K. O. Whyte. D. W. Heywood, D. M. Jemmett, R. A. Low, T. Bradshaw.

SNYDER—ROBERT BERTRAM, of Calgary, Alta. Born at Lashburn, Sask., on June 23, 1915. Educ.: B.Sc. (Civil), Sask., 1938; 1938-41, instru'man, P.F.R.A. Dom. Dept. of Agriculture; 1941-46, Lieut. Royal Cdn. Engrs. (4 yrs. overseas); 1946 to date, constrn. engr., Cdn. Western Natural Gas Co. (St. 1938, Jr. 1946)

References: F. A. Brownie, K. W. Mitchell, G. D. Kellam, W. L. Foss, G. L. MacKenzie.

STEWART—MURRAY DOUGLAS, of Galt, Ont. Born at Toronto on Sept. 19, 1916. Educ.: B.A.Sc. (Mech.), Toronto, 1939; R.P.E., Ont.; with Babcock Wilcox & Goldie McCulloch Ltd. as follows: 1939-40, dftsman., reciprocating machinery, steam turbines; (10 mos.) boilers & assoc. equipt.; 1940-41, developt. under supervision of Babcock Model "M" Vert. High Speed Single Cylinder steam engine for generator drive, made for Cdn. Navy; 1941-43, Lieut. Cdn. Army overseas; 1944-45, O/C light A.A. Workshop, Italy; 1945-46, O/C Brigade Engrg. Trade School, Cdn. Occupation Force, Germany; 1946-47, returned to Babcock, W. & G. Mc. Ltd., engrg. dept.; at present, Proposition Dept., calculation of boiler performances, collection of prices, estimates, specfns., layout, steam boiler units under Deputy Chief Engr. (St. 1939, Jr. 1946)

References: M. A. Stewart, G. W. Rayner, R. W. Angus, E. A Allcut, W. L. Sager.

FOR TRANSFER FROM THE CLASS OF STUDENT

LOCKE—LORNE WILLIAM, of Winnipeg. Born at Redcliffe, Alta., on Mar. 6, 1914. Educ.: B.Sc. (Elect.), Man., 1948; with Winnipeg Hydro Electric System as follows: summers, 1944 & 1945, operating staff; 1946, constrn. on hydro-electric developt.; 1947, constrn. on terminal, substation work; at present, mtce. engr., production div., Winnipeg. (St. 1948)

References: H. L. Briggs, T. E. Storey, D. C. Bryden, C. V. Antenbring, H. W. McLeod, A. M. Thompson.

VERDIER—HENRIK, of Montreal. Born at Copenhagen, Denmark, on April 28, 1918. Educ.: B.Sc., Sir George Williams College, 1947; one yr's. study of economics & administration, McGill; summers, 1937, dftsman Combustion Engrg. Corp., Mtl.; 1938, jr. dftsman Cdn. Marconi Co.; 1939-40, div. of physics & E.E. lab. asst., Natl. Research Council, Ottawa; 1940-41, dftsman., Cdn. Pacific Rly.; 1941-42, dftsman, Dom. Engrg. Works Longueuil; operated own business; 1941-42, Dftg. Service Reg'd.; 1942 (3 mos.) dftsman. Allied Brass Ltd.; (2 mos.) dftsman. Aluminum Co. of Canada, Mtl.; 1942-45, with R.C.N.V.R.; Lieut. (E); 1942, posted Engrg. Supt's. Staff, H.M.C. Dockyard, Halifax; 1943, Staff Officer, H.M.C. Torpedo School, i/c I.P.S.; 1944, H.M.C.S. "Givenchy", later Engrg. Supt's. Staff, Dockyard, Esquimalt, as asst. mgr. constructive dept. (ship repairs); 1945, completed education; 1947-48, engr. on sales & instaln., Holden Co. Ltd., railway, contractors, shipbuilders; at present, sales engr. injection, plunger & compression moulding of thermoplastic, Lacrinoid Products of Canada, Ltd., Buckingham, Que. (St. 1945)

References: A. C. Turtle, V. Harisay, R. C. F. Alexander.

NEWS of the BRANCHES

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Edmonton

E. K. Cumming, M.E.I.C.
Secretary-Treasurer

Urban Transportation was the subject of an address by Norman D. Wilson, consulting engineer of Toronto, at a dinner meeting of the Edmonton branch held on January 19, 1949. Branch chairman H. W. Tye presided. The speaker who was in Edmonton making a study of the city's transportation problems, was introduced by City Commissioner D. B. Menzies, who spoke of Mr. Wilson's wide experience in the transportation field as consultant to many cities and as director of the Brazilian Traction Company.

Mr. Wilson began by reviewing urban transportation from the days of the horse-drawn street car up to the present time. He described the first period of the electric street railways which began in 1890 and it's effect on the design of city thoroughfares and on traffic legislation. This period was followed by the development of the motor bus shortly after the first world war. Motor buses were first operated in cities where the street railway system was unable to expand quickly enough to keep up with the rapid expansion in many cities due to war time prosperity. Mr. Wilson also spoke of the collapse of all private street railway companies and transfer of transportation responsibilities from private to public organizations.

The speaker discussed transportation systems in various cities in South and North America and illustrated his remarks with a number of excellent slides. He showed the effect of the rush hour peak on the number of vehicles required and fare cost. He stated that the main problem, where transit systems are concerned, is the provision of a thoroughfare for buses and street cars as well as automobiles, and that the cost of such thoroughfares should be borne by the automobile users and transit system jointly. In concluding his remarks Mr. Wilson stated that the problem of handling automobile traffic is a serious one, and illustrated this statement by saying that if all members of office staffs in a down-town area drove automobiles, one-half of all office floor space would be required for their parking, with no allowance for customers and patrons.

A vote of thanks to Mr. Wilson was moved by Tom Main and was heartily approved by the 150 members and guests present.

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A dinner meeting of the Edmonton branch was held Wednesday evening, February 2, at which a paper on **The Underground Electrical Distribution Network for the City of Edmonton,** was presented by Stan Hampton and C. Z. Monaghan, electrical engineers with the City of Edmonton Electric Light and Power Distribution Department.

In his remarks Mr. Monaghan reviewed briefly the preliminary studies which were made before transfer of overhead electrical distribution lines to underground. He stated that a ring main network had been selected for a number of reasons, the most important being the excellent reliability of service obtained with such a system. Mr. Monaghan said that seven 500-k.v.a. transformers had been installed in the most heavily loaded down-town area. The plans for this year call for the installation of nine more 500-k.v.a. transformers with an ultimate aim of having the whole down-town area eventually served by the underground system. The speaker showed a number of drawings indicating the placing of the transformer vaults at the lane and street intersections with service manholes at various points between the transformer vaults. He also exhibited a sample of the secondary cable being used. This Neoprene-covered cable was selected because it was felt it would give better service than lead covered cable.

Mr. Hampton described the installation of the system, using a number of very fine photographs to illustrate the various steps carried out. He showed the problems encountered in installing the transformers and in pulling the cables. Mr. Hampton said that the only real difficulty encountered was in balancing the load, in changing from the old three-wire to the new-four wire secondary distribution system. He said that they found it necessary to shift some of the loads, but with a certain amount of experimentation, it was found possible to balance all loads. Since the installation of the system in September there have been two transformer faults without any interruption in the service to consumers.

The speakers were introduced by W. Cowley and a vote of thanks was moved by T. E. Bate. This vote of thanks was heartily approved by the 80 members present who thoroughly enjoyed the address on a topic of local interest.

Lethbridge

D. Cramer, Jr.E.I.C.
Secretary-Treasurer
A. E. Lawrence
Branch News Editor

Mr. A. D. Palmer, vice-president of Sturdie Propane Limited, Lethbridge, addressed a meeting of the Lethbridge Branch, at the Marquis Hotel, on January 15, on the subject **The Manufacture and Distribution of Liquified Petroleum Gas in Alberta.**

Vice-Chairman R. D. Livingstone, presided, with about 30 members present, and Institute affairs were reviewed by Secretary D. Cramer. E. A. Lawrence introduced the speaker.

Mr. Palmer said the manufacture and distribution of Liquified Petroleum Gas (Propane) in the Province of Alberta is a new industry introduced from the United States, where it has been in successful operation for some years. Last year there were 2,600,000,000 gallons of this gas used by some 4,000,000 consumers in the United States.

The late Dr. Boomer was largely responsible for the early development of this liquified petroleum gas in Alberta, and later Mr. Blackstock of the Industrial Development Board gave his support to the further development and study of its potentialities. Finally Mr. Barber of Calgary installed a Propane Plant at Turner Valley.

The waste gases of Turner Valley which used to be burnt at the flares are now collected and mixed with a small percentage of crude. This mixture is put through an absorption plant where the undesirable ingredients are eliminated and the impurities removed. The remaining gas propane is then liquified at a pressure of about 400 p.s.i. and stored in tanks at Turner Valley.

Mr. Palmer discussed methods by which Propane proceeds from Turner Valley to Alberta distributors and consumers, and went on to remark that up to November of 1948. Propane was imported from the United States, but the Alberta consumer now uses Turner Valley Propane, and the number of consumers are increasing rapidly. Propane is used for cooking, hot water heating and also as a motor fuel. It is also used for the enrichment of manufactured gas produced in cities where natural gas is not available. It is more expensive than natural gas, but as a compensation, has about $2\frac{1}{2}$ times the heating potential.

An interesting discussion followed Mr. Palmer's address and a very hearty vote of thanks was expressed on behalf of the branch by P. E. Kirkpatrick.

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Sixty-three members and guests of the Lethbridge Branch gathered at the Marquis Hotel for a Ladies Night dinner meeting on February 19, 1949, and to hear Mr. Harold Long, general manager of the Lethbridge Herald, speak on **The Early History and Economics of Southern Alberta Irrigation.**

Chairman W. L. Foss presided. Dinner music provided by Mr. and Mrs. Geo. Brown and community singing led by R. S. Lawrence were much enjoyed. Excellent entertainment was featured by Miss Jackie Boyle, vocalist, Mrs. R. L. Francis, violinist accompanied by Mrs. F. C. Russell; and Mr. C. Daniel, vocalist, accompanied by Mrs. Daniel.

Mr. Long was introduced by C. S. Clendenning. He commenced by tracing the early history of Southern Alberta, closely correlated with the history of irrigation, from the establishment of Fort Macleod in 1874. He told how cattle were brought in to provide food as the buffalo was rapidly disappearing. He described the early development of coal at Lethbridge by British capital in the North West Coal and Navigation Company, which later became the Alberta Railroad and Irrigation Company and was given a land grant by the Government in subsidy to building the railroad.

Charles Alexander Magrath, a young engineer employed by the A.R. & I. to find ways to put the land to use, suggested irrigation. Water from the St. Mary River first reached Magrath in 1899 and Lethbridge in 1900. The first sugar factory was started by Mr. Jesse Knight at Raymond in 1905. However, irrigation was not popular at this time as rainfall was plentiful and tremendous crops could be raised on dry land. But droughts eventually came and the years of 1910, 1914, 1917, 1918 and 1919 were particularly bad. The demand for irrigation came back.

The Lethbridge Northern Irrigation Project was started in 1919 under heavy debt and the Alberta government backed the bond issue.

Poor prices for crops made payment by the farmers impossible, and the debt was cut down by the Government. However, the average yearly gross return in the last five years from this project has been equal to the original five million dollar capital cost of the project. Today, the Dominion government is building and financing the main structures and canals for the St. Mary-Milk Rivers Development, which will add 390,000 acres of irrigated land to the former A.R. & I. Project.

In concluding, Mr. Long stated that the most pressing problem today is to set up industries and find markets for the products of irrigated land, and the greatest possible use must be made of the available water resources, particularly the waters of international streams, since they are rapidly being made use of by the United States.

E. A. Olafson, of Regina moved a hearty vote of thanks to Mr. Long for the very interesting and excellent talk.

London

G. E. Humphries, M.E.I.C.
Secretary-Treasurer

R. G. Code, M.E.I.C.
Branch News Editor

The Annual Dinner Meeting of the London Branch of the Institute was held on January 31 in the Wolseley Barracks Reserve Force Officers Mess. Members of the Military Engineers Association were guests at this meeting.

A very interesting and enlightening address was given by Gordon R. Henderson of Sarnia, chief engineer for the Polymer Corporation of Canada. It was entitled **Polymer, the Growth of an Industrial Area.**

Mr. Henderson introduced his subject by giving a description of the general organization of the Polymer Corporation and cited various reasons for the strategic location of the plant. Freedom from submarine warfare menace necessitated an inland location, and Sarnia was chosen on account of the unlimited quantities of fresh water from Lake Huron, the immediate locality of chemical salts, piped oil, railway and transport centre, and a flat terrain which could be used in future expansion of the industry and development of the suburban areas of the present City of Sarnia.

The manufacture of such by-products as styrene and ethylene were outlined, along with that of glycol at the Dow Chemical plant, which was installed in 1947. "Cold rubber" from a highly reactive catalyst system and its contribution to the economic system was discussed.

Aside from technical processes described, the speaker pointed out many economic features relating to the rubber industry as a whole, and illustrated how Polymer has a far greater economic value to Canada than a mere industrial development.

Mr. Henderson was introduced by E. V. Buchanan, London, and thanked for his excellent address by James A. Vance of Woodstock.

The new officers of the London Branch were introduced at this meeting.

Guests at the head table were Major Geo. E. Humphries, M.B.E.; James A. Vance; E. V. Buchanan, vice-president, Association of Professional Engineers of Ontario; Gordon R. Henderson; A. L. Furanna, chairman of the Branch; W. C. Miller, city engineer of St. Thomas, Ontario; George N. Scroggie, vice-chairman of the Branch; and Colonel Norman W. J. Smith, D.S.O., chairman of the Military Engineers Association, London Branch.

The London Branch meeting of January 31.

Moncton

V. C. Blackett, M.E.I.C.
Secretary-Treasurer

Various aspects of town planning as ffecting the City of Moncton were ealt with by three speakers at a branch ıeeting held on November 22nd. S. R. 'rost was the presiding chairman. The ırst paper was presented by R. L. Parsons, who confined his remarks to the raffic problem. Street widening, where easible, was advocated by Mr. Parsons ut improvement in conditions would e mainly dependent on the re-routing f traffic, one way streets, and the openıg up of service lanes for the unloadıg of trucks behind stores on the main usiness streets.

The second paper, read by G. L. Dickson, dealt with the feasibility of reducıg the smoke nuisance. He suggested central heating plant for the railway uildings and the use of more oil electic power in the shunting yards. The iversion of all freights around Moncton ould, he said, relieve the city of much f the smoke. J. A. Godfrey, the third peaker, enlarged on this topic and read art of a paper on smoke, which he has repared for the Town Planning Comıission.

After light refreshments, two moving ictures were shown. The first was a ocumentary film showing how the Parsons Construction Company built Moncton's wartime housing units in record me, using on-the-spot factory prefabcation methods. The second film was March of Time production on atomic nergy.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

The regular meeting of the Branch as held in the Birch Room of the Welınd House in St. Catharines on Thursay, February 3.

Following refreshments and dinner, Chairman R. A. Coombes called on rthur Bennet, who introduced the uest speaker, E. N. Davis, personnel ıanager, Campbell Soup Co., Ltd., and ıember of the Ontario Labour Relaions Board.

In the development of the subject, **ndustrial Economics and Engineering** the peaker brought to his audience a picure of a multitude of perplexing huıan problems that have risen and are ising every day, in industry, as a result f the steady advance of technological cience. As an illustration he pointed ut that due to engineering progress he following changes have taken place ı industry in the forty years from 1899 o 1939: worker productivity has douled, working hours have been reduced rom 54½ hours to 40 hours per week, nd at the same time the weekly wage as jumped 37 per cent, averaging $450 ıore per year per man. These changes ave had prodigious effects, and the huıan problems involved in the fair diision of the increased wealth have been ompounded at an amazing rate. Mr. Davis gave a number of specific exmples and explained how many of hem had been solved.

The address was followed by a lively eriod of questions. P. E. Buss tenderd a warmly seconded vote of appreciation to the speaker who had opened a viewpoint not completely familiar to all engineers but well worth their most sincere consideration.

Saguenay

T. T. Anderson, Jr.E.I.C.
Secretary-Treasurer

On January 28, 1949, Dr. Huet Massue, M.E.I.C., addressed the Saguenay Branch on the subject of **The Tennessee Valley Authority.** The meeting took place in the Arvida High School Auditorium. Dr. Massue is an engineer economist with the Shawinigan Water and Power Company, Limited, Montreal.

Before introducing his main topic, the speaker showed a very interesting series of slides covering the growth of Institude Membership by year and by Province.

On the subject of T.V.A. Dr. Massue presented a very complete statistical picture by means of slides. Of some eighty million potential horsepower in the U.S.A., some nineteen millions are developed. The T.V.A. project constitutes about one and one half million horsepower to-date.

Dr. Massue showed charts to illustrate that in most industries the cost of electricity alone is not sufficient to decide the location of the industry. Exceptions to these are perhaps aluminum and pulp and paper industries which consume some 60 per cent of power developed in Quebec Province.

Dr. Massue showed that in the case of the T.V.A. project only about 40 per cent of the investment was charged against power production, the balance going against flood control and navigation. Dr. Massue intimated that the benefits derived from flood control and navigation did not justify the expense written off against them.

The speaker was concerned with the wrong impression received by the public on the cost of public hydro-electric installations compared to private utilities. If taxes lost and interest charges are taken into account, the cost of public installations is generally greater than comparable private enterprises.

The speaker answered a number of questions after the talk. Mr. R. A. Lemieux, M.E.I.C. provided a vote of thanks.

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At a meeting of the Saguenay Branch on February 15, 1949, three speakers outlined the **Development of the Saguenay System.**

F. H. Duffy, system protection engineer and acting electrical engineer of Aluminum Company of Canada, Limited, Shipshaw, outlined the growth of the Saguenay System especially as it affected oil-circuit-breaker interrupting capacities. His talk covered development of the system from its inception in 1926 until the present day.

A paper by Mr. E. W. McKernan, superintendent of Saguenay Power Company, Limited, Isle Maligne, described recent changes in the 13.2 k.v. bus arrangement in the power station at Isle Maligne which were necessitated by growth of the system. Mr. Kernan was unable to attend the meeting and his paper was read by G. R. LaBossiere of Isle Maligne station.

F. A. Brown, assistant chief operator of the Power Department of Arvida Works, outlined methods that were used to make changes at the Arvida 154-k.v., substation to provide more flexible and efficient operation.

The speakers were introduced by the chairman, W. P. C. LeBoutillier, and thanked by A. B. Sinclair.

Junior Section

W. A. Dayton, M.E.I.C.
Secretary-Treasurer

A meeting of the Junior Section of the Saguenay Branch was held at the Saguenay Inn on February 7, 1949.

R. V. Smith of the Aluminum Company of Canada, Limited, addressed the meeting on **Ships and Their Engines.** Mr. Smith was in the Merchant Navy throughout the war, taking part in the Dunkirk and Singapore evacuations.

He described the different types of ships in the Merchant Fleet and discussed the factors which govern the choice of engines for each class. He traced the development of steam and Diesel engines and gave a brief description of the steps which led to their present high level of efficiency. The training of an engineer from his apprenticeship through to the rank of chief engineer in the British Merchant Navy was briefly summarized, thereby illustrating the thorough training in the practical and theoretical aspects of this profession. The talk was illustrated by some interesting slides showing various installations of marine steam and Diesel engines.

A period of discussion followed, during which the audience showed great interest in the subject.

The meeting was the second Annual Smoker held by the Junior Branch and was very well attended.

Chairman T. T. Anderson introduced Mr. Smith, who was thanked on behalf of the section by S. H. Rochester.

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

A. R. Bonnell, M.E.I.C.
Branch News Editor

The annual joint dinner of the Saint John Branch and the New Brunswick Association of Professional Engineers was held January 27 at the Admiral Beatty Hotel.

After refreshments and dinner, a toast to the Association of Professional Engineers was proposed by R. M. Richardson, and responded to by John Mooney. A toast to the Institute was proposed by L. O. Cass and responded to by Don Fonger, president of the Engineering Society at the University of New Brunswick.

The speaker for the evening was T. C. Macnabb, retired superintendent of the Canadian Pacific Railway.

Mr. Macnabb had chosen as his topic **Building a Railroad.** He spoke of the difficulties that would be encountered in building the "E.I.C. Railroad" from Saint John to Quebec.

Mr. Macnabb began with the difficulties that would be encountered in getting a charter from the Legislature, in making surveys and buying right-of-way, telling of methods which would be used by the "Company's" agents in buying land cheaply. He told of all the staff that would be required to carry on the business and comply with government regulations, and of the freight rates which would be required to carry this staff, meet other operating costs, and pay the stock holders and of the difficulty of getting the government to grant these rates. Mr. Macnabb concluded by accepting the government's offer to buy his railroad at half its cost.

Following Mr. Macnabb's talks, Mrs. Dora Breau and her troupe staged a floor show which included dancing chorus, acrobatics, singing, tap dancing and comedy skits.

Mr. Macnabb's humorous talk, followed by a floor show, was greatly appreciated by engineers present, as a departure from the usual form of meeting.

St. Maurice Valley

G. W. Ince, Jr.E.I.C.
Secretary-Treasurer

J. G. MacLeod, M.E.I.C.
Branch News Editor

On December 9, 1948 a Film Night was held at the Cascade Inn, Shawinigan Falls. The following films were shown: "Beaverships", "The World's Largest Electrical Shop", and "Men Against Rock". J. T. Thwaites, Canadian Westinghouse Company, and Charles Marsh, Canadian General Electric Company, spoke briefly between films.

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The first meeting of the new year was held on January 20 at the Cascade Inn, Shawinigan Falls, and took the form of a lecture meeting. At the start of the meeting two members were elected to the Branch Nominating Committee. R. E. Kirkpatrick, immediate past secretary-treasurer ,then spoke briefly on the recent revision of the Branch by-laws which was before the membership for approval.

The first talk was given in French on **Administration Municipale** by R. Dorion, M.E.I.C., city manager of Shawinigan Falls. Mr. Dorion pointed out that the classification of villages, towns and cities is based on the population, and that a city is managed much like a corporation. The mayor and aldermen of a city correspond to the president and board of directors of a corporation, and the city manager and city engineer to the general manager and chief engineer. He noted that nearly all the city managers in Quebec are engineers.

The second paper was given by E. A. Delisle, M.E.I.C., city engineer of Shawinigan Falls. Discussing **City Planning in Shawinigan Falls,** he began with the historical background of Community Planning and outlined the subject. The engineer is well suited to make a technical approach to the problem and synthesize the results of geographical and topographical surveys, transportation facilities, and industrial sites into the master plan. One of the most important factors in town planning is zoning, which divides the land into various areas according to population density, height and density of buildings, commercial and residential districts. Mr. Delisle dealt with Shawinigan Falls in particular, and told of the difficulties that are being encountered because the city grew up on project planning rather than community planning.

After a question period the speakers were thanked by C. G. de Tonnancour of Shawinigan Falls.

Junior Section

W. R. Ford, Jr.E.I.C.
Chairman

The short lull in activities after a heavy summer programme was broken by a very well attended meeting in September at which E. R. Williams, M.E.I.C., spoke on his trip to South Africa. J. S. Whyte spoke to the Section the following month on the **Development of Carbide in Shawinigan Falls.** In November a tour was conducted through the new power development of the Shawinigan Water & Power Co. at Shawinigan Falls. At that time one of the new units was in operation and the other two were in various stages of construction. Ladies were invited to the December meeting which featured a "Movie Night" with industrial and skiing films. A lecture meeting was held in January when W. D. Mosher spoke on **Engineering and Natural Resources.** At this meeting the by-laws of the Section were finally approved and a nominating committee was named.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bing-Wo, M.E.I.C.
Branch News Editor

At the regular monthly meeting of the Saskatchewan Branch held on January 21 at the Kitchener Hotel in Regina, C. N. Munro, M.E.I.C., chief engineer, Water Rights Branch, Department of Natural Resources discussed **Some Aspects of Water Supply as it Affects the Prairie Provinces.**

Mr. Munro pointed out that water is a scarce resource in the province of Saskatchewan. The average precipitation ranges from 9 in. to 17 in., making the run-off per acre very small. The water supply situation very often determines the practicability of industries locating in certain areas.

The most dependable source of water supply for Saskatchewan lies in the international and interprovincial streams and rivers. These are the North and South Saskatchewan, Churchill, Souris and Qu'Appelle rivers. For Saskatchewan's needs, the Saskatchewan River is apparently the most reliable. Since this river flows through Alberta and Manitoba also, these provinces have a vital interest in the proposed use of it's waters. Mr. Munro went on to describe the irrigation works proposed and already developed on the Saskatchewan and it's tributaries in Alberta and drew attention to large proposed irrigation tracts in Saskatchewan now under study by the P.F.R.A. Other industries such as fur farming in the Cumberland area of Saskatchewan and fishing in Manitoba were described. In order that interprovincial rivers be used to the best advantage of all, a newly organized body, the Prairie Provinces Water Board has been set-up. The function of this body will be study of the potential uses of interprovincial streams, the allocation of water and the recommendation to the governments of the best plan of overall development.

Manitoba's interest in the plans of Saswatchewan lies in the fact that it's main source of hydro power in the Winnipeg River is rapidly being overtaxed. In that province's search for a new source of hydro power, there is a scheme whereby the North Saskatchewan is diverted into Lake Manitoba and finally dropped 90 ft. into Lake Winnipeg. In this way it is claimed that the whole of the flow in the Saskatchewan River could be utilized.

A lively discussion period followed Mr. Munro's address. J. W. Farrell moved a vote of thanks to the speaker.

Toronto

R. A. Muller, Jr.E.I.C.
Secretary-Treasurer

On Saturday, February 12th, the Branch held its Annual Ladies' Night at the Albany Club. The speaker was Mr. John Ness, a geologist of long standing with Imperial Oil Company. Mr. Ness was awarded the Institute's Leonard medal some time ago and has also been on Council. The subject of his address was **Western Oil Discoveries** and was followed by a movie entitled "A Mile Under the Wheat". It was an excellent talk, concise, and interesting because it not only revealed the extent of exploratory work but also Canada's economic position in respect to oil.

Of particular interest and highly gratifying to the branch was the presence of W. J. W. Reid, president of the Association of Professional Engineers of Ontario, and Mrs. Reid, who did us the honour of motoring over from Hamilton to be present. Mr. Reid is also vice-president-elect for the Ontario Region. Also, we were glad to have Mr. and Mrs. R. L. Dunsmore (International Petroleum Company). Mr. Dunsmore is a past vice-president of the Institute. These two couples along with the branch vice-chairman Ross Graydon and Mrs. Graydon, Mr. and Mrs. Whitson. the speaker, Branch Chairman J. F. MacLaren and Mrs. MacLaren made up the head table.

In addition to the address by Mr. Ness the programme included a "Lucky-Numbers Draw" for the ladies, and a performance by a magician-comedian.

Because of limited capacity the sale of tickets was not pushed, but nevertheless about 126 were present and all seemed to go away happy about the affair.

Dunc. Whitson, the able chairman of the entertainment committee, aided by his good wife, did a splendid job in arranging for the evening and in carrying out the details.

Junior Section

On January 18 the Junior Section of the Toronto Branch held its annual Ajax Meeting, in the Recreation Hall of the Ajax Division of the University of Toronto. This meeting was conducted in the form of a panel with three guest speakers addressing the student body on **Professional Employment.**

The first speaker was L. D. McKenna, placement officer of the Technical Service Council, who explained how the Council was founded over twenty years ago by a group of public spirited citizens. Its function is to aid in placing engineers who are seeking employment and also to encourage industry to make more use of the professional engineer.

The Council is an independent, non-profit organization and is maintained by voluntary subscriptions from industry. No fees are requested, but it requires approximately fifty ($50.00) dollars to place an applicant in a job.

Mr. McKenna said employment opportunities at the present time are numerous and favourable, and starting salaries depend upon a man's character, his past experience, and the location of the job.

Colonel Kenneth Bradford, director of the University of Toronto Placement Service, was introduced by Mr. McKenna. The University Placement Service, it was explained, maintains a list of positions which are open, as well as information regarding the various industries operating in Canada. Starting salaries offered this year are better than those of last year, and there is still a wide variety of opportunities for the young graduate engineer.

The Placement Service also maintains a list of positions open in South America, Trinidad, the Netherlands and the United States.

Many firms in this country need engineers but as yet they have not obtained any. Colonel Bradford asserted also, that engineers are becoming increasingly active in a wide variety of non-engineering work.

Colonel T. M. Medland, executive director of the Association of Professional Engineers, was then introduced by Colonel Bradford.

The requirements of any profession, as expressed by Colonel Medland, are organization, education, experience and exclusion. The organization is achieved by such bodies as the Association of Professional Engineers of Ontario. Education must be pursued by the engineer throughout his entire life, and his experience depends upon himself. The exclusion of the unfit is accomplished by the licensing bodies of the provinces.

The Association attempts to broaden the field of opportunities by making Industry aware of the uses of the professional engineer. Contact is also made with service clubs and the general public to acquaint them with the service of engineers.

The speakers were thanked by Mr. T. J. Hogg of the Junior Section.

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On Saturday morning, January 22, the Toronto Branch—Junior Section visited the Hamilton Works of the Steel Company of Canada Limited. The group, consisting of sixty-six (66) members and guests, was divided into five groups, each led by a most competent guide, made available by Stelco.

The visit included inspection of the entire process from coke ovens and blast furnaces where pig iron is drawn off to open hearth furnaces where steel is born, to soaking pits, blooming mills, billet mills and finishing mills where steel is shaped into plate, strips, sheet and bars—the finished products of the Steel Company.

Transportation between Toronto and Hamilton was supplied by members of the Section who kindly made their cars available for the trip.

The Junior Section has planned a Stag Party and a field trip to the Hydro development at Des Joachims in March. The Annual Meeting will be held in April. Further particulars of these events will be sent to all members.

Vancouver

A. G. Fletcher, s.e.i.c.
Secretary-Treasurer

Stuart Lefeaux, jr.e.i.c.
Branch News Editor

On January 19 about seventy members of the Vancouver Branch gathered in the Medical-Dental auditorium to hear Harry Minshall, erection engineer for the Dominion Bridge Company, Pacific Division, speak on **Emergency Bridging.** The address dealt with three particular projects in lower central British Columbia in which railroad bridges had been washed out by flood conditions prevailing generally in British Columbia during May and June of 1948. It was explained that these floods were the worst on record since 1849 and that the amount of water flowing in the various rivers was approximately three times as great as that during a normal freshet season.

The speaker showed slides of the three bridges, the first one being over the Elk River at mile 52.6 on the Canadian Pacific Railway branch line, in which one abutment suffered so severely from scouring that the bridge span had to be supported on a temporary structure of steel H piles driven at the first panel point pending reconstruction of the abutment. The second emergency bridging was over the Nicola River at mile 18 on the Canadian Pacific Railway branch line, where one of the piers suffered so badly from scouring that the span was dropped into the water and wrecked so completely as to preclude replacement. A platoon from the Royal Canadian Engineer's Training School at Chilliwack was brought to the job and received valuable training experience in demolishing the span and the abutments. At the same time work proceeded on construction of an alternate crossing, making use of two 80-ft. plate girder spans brought in from Ontario and placed on pile supports. The third emergency job was accomplished on the bridge over the North Thompson River on the Canadian National Railway line at mile 28.8, three miles west of Savona in which two of the six spans in the crossing were in danger of being dropped into the water by the tilting of one of the piers. These two spans were successfully pulled back into the adjacent remaining spans, the defective pier demolished and the two spans rolled back into place.

The excellent talk by Mr. Minshall was supplemented by slides of photographs taken on the job, giving a complete review of these very exceptional undertakings.

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On Wednesday, February 2, twenty members of the Vancouver Branch attended a luncheon and field trip at the No. 214 Base Work Shops, R.C.E.M.E., Jericho, Vancouver.

After the luncheon at the officers mess, Major Bradbury outlined the tour of the shops where radar, telephone communications, electrical equipment, internal combustion engines and other military equipment are serviced and repaired. The members attending received excellent descriptions and explanations of the work, and all agreed the army again came through in unexcelled fashion. Colonel Sherman thanked the hosts for the hospitality and arrangements.

Victoria

D. A. MacLean, jr.e.i.c.
Secretary-Treasurer

T. A. J. Leach, m.e.i.c.
Branch News Editor

The increasing demand for more and better maps was stressed by Lt.-Col. G. S. Andrews in his address on **Aspects of the Mapping Problem in B.C.,** presented to the Victoria Branch of the Institute on January 21.

Economic development included hydroelectric power, watershed and flood control, and forest management, calls for various types of map refinement.

Colonel Andrews, who is chief engineer of the Air Surveys Division of the Provincial Government, stated that large areas of B.C. have not yet been mapped. Production of the standard topographical map, also, has not kept pace with available air photo coverage.

To meet the immediate demands a programme of interim mapping has been introduced which makes use of whatever control is available. With a speed-up in the standard map programme the interim maps will be gradually superseded.

To speed up field work, Colonel Andrews pointed out, a large increase in staff would be required. This would mean a greater standardization of methods with experienced personnel acting in a supervisory capacity. In this way men with limited technical training would be able to do much of the routine work.

The recent addition of air transport for men and supplies has cut down the travelling time in the field. The most recent development has been the helicopter but experience has shown that the performance of the helicopter at higher altitudes around 6000 ft. is not dependable due to the rapid decrease of air density with altitude.

The use of the optical micrometer reading transit has increased the accuracy of field surveys. Recent developments within the Survey Branch on ground cameras have reduced their weight from 30 or 40 pounds to 7 pounds. This, together with the replacement of glass negatives by roll film, has increased the mobility of field parties.

Recent modification of its methods of photography allow the Division to produce interim maps showing planimetric detail, cultural features, and rough form lines. In plotting, the slotted templet method of control has replaced the radial line plot.

During the recent war tri-camera photography was developed and this rapid method of air photo cover is being used in B.C. It is hoped that in a short time, using tri-camera photos, a yearly coverage of 20,000 square miles will be obtained and that more accurate information will follow with the completion of the vertical photo programme.

(*Continued on page 172*

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST with some experience in the manufacture of pulp, paper and converted products required for Province of Quebec to take charge of the testing staff of a sub-section of the technical dept. under the general direction of the Technical Superintendent. Salary open Apply to File No. 1098-V.

CHEMICAL ENGINEER OR CHEMIST, with some experience in inks or colour mixing required to set up a colour mixing department and a small chemical laboratory. Must be bilingual. Position in Province of Quebec. Salary open. Apply to File No. 1116-V.

CHEMICAL ENGINEER OR CHEMIST, recent Ph.D., or equivalent with good background in organic chemistry preferably along the lines of wood and cellulose chemistry and fuels technology. Applicant needs capacity for contacting plant personnel and appreciation of engineering phases of problems. Position in British Columbia. Salary open. Apply to File No. 1118-V.

CHEMICAL ENGINEER, recent graduate, required for junior position by industrial plant in the Province of Quebec. Salary open. Apply to File No. 1119-V.

JUNIOR CHEMICAL ENGINEER required by chemical company in Toronto for process control work at their salt plant in Nova Scotia. Salary open. Apply to File No. 1121-V.

CHEMICAL ENGINEER, recent graduate, required for position in technical department of a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 1122-V.

CHEMICAL ENGINEER required as plant chemist by large newsprint mill. Preferably four to six years in the pulp and paper industry in chemical and control departments. Salary open. Apply to File No. 1131-V.

CHEMICAL ENGINEER required in Ontario. Duties will involve the compounding for and quality control of industrial rubber goods. Previous experience in the rubber industry would be an advantage. Salary open. Apply to File No. 1133-V.

CHEMICAL ENGINEERS required by chemical plant in Province of Quebec. Duties include responsibility of the production and the operation of chemical equipment such as filter presses, evaporators, vacum jets, solvent recovery, etc. Salaries open. Apply to File No. 1134-V.

CIVIL

CIVIL ENGINEER, required in Ottawa, must have at least ten years experience in the design of frame houses and wood structures. Salary open. Apply to File No. 1108-V.

CIVIL ENGINEERS, required by public utility in Toronto. Must have at least five years experience in design of steel structures on Power developments. Salary open. Apply to File No. 1109-V.

CIVIL ENGINEER, recent graduate, required by Montreal firm of contractors and engineers. Applicant must have an understanding of the following subjects or be prepared to acquire same: general construction, engineering, estimating, elementary surveying, construction practices, etc. Salary entirely dependent upon ability. Apply to File No. 1114-V.

ELECTRICAL

ELECTRICAL ENGINEERS, experienced in the maintenance of power meters and relay protection schemes also men exeprienced in installation of large rotating electrical machines, high voltage and low voltage switch gear. Manufactures test experience preferred. Positions with public utility in Toronto. Salaries open. Apply to File No. 1109-V.

ELECTRICAL ENGINEERS required by public utility in Toronto. Must have the following experience: Design, layout and estimates for medium and large, low voltage and high voltage substations or design and construction of transmisison and distribution lines. Salary open. Apply to File No. 1109-V.

ELECTRICAL ENGINEERS required by public utility in Toronto. Must be experienced in communications preferably a specialist in radio and frequency modulation also knowledge of power and telephone line carriers required. Salary open. Apply to File No. 1109-V.

ELECTRICAL ENGINEER for sale of electrical and allied machinery in Southern Alberta to open branch office in Calgary. Must have trade contacts and interest in firm can be purchased by a proven suitable man. Apply to File No. 1123-V.

ELECTRICAL ENGINEER between 35 and 40 years of age with a minimum of five years experience with a public Utility or related industry required as Manager's Assistant for electrical distribution system in fast growing town of 25,000 population. Salary open. Apply to File No. 1124-V.

JUNIOR ELECTRICAL ENGINEER required in Toronto for designing Selenium Rectifiers and some Carrier Current Control equipment. Salary open. Apply to File No. 1136-V.

SENIOR ELECTRICAL DRAUGHTSMAN required in Toronto. Must have considerable experience on generating and substation layouts. Salary open. Apply to File No. 1137-V.

MECHANICAL

MECHANICAL ENGINEER, required as Service Promotion Man for Export Division of large National Organization Must have good technical background and service experience in the automotive industry. Responsibilities include writing and editing promotion material, policies, bulletins and elective letters. Salary open. Apply to File No. 1110-V.

MECHANICAL ENGINEER, recent graduate, required as sales engineer by a firm of Power House and Building Specialties. Job located in Ontario and training period in Montreal. Salary $250. Apply to File No. 1126-V.

*MECHANICAL ENGINEER, required as assistant to senior engineer. Previous experience, three to five years in heavy industry and plant layout required. Excellent prospects for advancement. Salary range $300 to $350 per month to start. Apply to File No. 1129-V.

*MECHANICAL ENGINEER with four to five years experience in design, layout and detail work. For preference, but not necessary, with experience in the paper industry. Must be capable of taking charge of a drawing office under the Plant Engineer in large newsprint mill. Salary open. Apply to File No. 1131-V.

*MECHANICAL ENGINEER with background of production processing and tool design experience. Required as sales engineer by manufacturer of special purpose machine tools, jigs, fixtures, gauges, ets. Located in Windsor, Ont. Salary open. Apply to File No. 1138-V.

METALLURGICAL

METALLURGICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in research, development and production. Salary open. Apply to File No. 1106-V.

MISCELLANEOUS

GENERAL MANAGER, to supervise all operations including steam and diesel generating stations, transmission and distribution systems required by large Canadian electrical utility. Administrative ability and experience chief qualifications. Up to date knowledge of power industry also desirable. Salary open. Apply to File No. 1104-V.

COMBUSTION ENGINEER wanted by large indsutry near Montreal. Must be capable of taking charge of high pressure boilers, turbo generators and boiler house personnel. Permanent position and good salary. Apply to File No. 1105-V.

GRADUATE ENGINEERS interested in applied research in inorganic physical chemistry required for research laboratory of Montreal firm. Applicants should have from two to five years experience. Salary open. Apply to File No. 1107-V.

ELECTRICAL OR MECHANICAL ENGINEERS with experience in electrical, industrial and commercial equipment and domestic appliances for frequency Conversion Program. Position with public utility in Toronto. Salary open. Apply to File No. 1109-V.

GRADUATE ENGINEERS, preferably with six to ten years' post graduate experience to act as field representatives of Technical Information Service, N.R.C. in Montreal and Toronto. As the work involves personal visits to industrial firms, a personnally owned car is essential. The Montreal representative must be fluently bilingual. Apply to File No. 1115-V.

GENERAL MANAGER required for Saskatchewan Power Commission. Position requires full responsibility and authority for all operations. Principal requirements, administrative, engineering or other technical experience in power operations very desirable. Salary open. Apply to File No. 1117-V.

* Closed since appearance in March Bulletin.

SALES AND SERVICE ENGINEERS required for selling and servicing of water treatment chemicals and water treatment equipment of all types throughout Canadian industry. Considerable travelling involved. Applicants preferably not over 27 years of age. Positions located in Southern Ontario and Maritimes. Salary open. Apply to File No. 1120-V.

A GRADUATE ENGINEER required by chemical company in Toronto to carry out research work on product improvement. Salary open. Apply to File No. 1121-V.

ASSISTANT CITY ENGINEER required by City of Calgary, Alberta. Applicant must have executive ability and preferably experience in Municipal work covering sewers, sewage disposal, streets, paving, sidewalks, bridges, building construction and Town Planning. Salary range $3,500 to $4,500. Apply to File No. 1125-V.

*STRUCTURAL DESIGN ENGINEER required in Montreal. Preferably some experience in Building design and architectural work. Salary open. Apply to File No. 1127-V.

CIVIL OR MECHANICAL ENGINEERS required for openings in connection with construction of new refinery being built at Montreal East. Preferably some experience in heavy chemical industry also junior vacancies. Salary open. Apply to File No. 1128-V.

JUNIOR SALES ENGINEER required in Montreal by large industrial firm. Preferably with a couple of years experience and the desire to get into sales work. Salary $250. Apply to File No. 1130-V.

JUNIOR ENGINEER required by American Company for their three factories located in Canada. Duties include supervision of office routine, order supplies, etc. Knowledge of French and English would be an advantage. Salary open. Apply to File No. 1132-V.

MAINTENANCE ENGINEER, mechanical or electrical background with about ten years experience including plant maintenance. Duties include responsibility for mechanical and electrical maintenance, general supervision of power plant and mechanical stores. Salary open. Apply to File No. 1135-V.

JUNIOR ENGINEER with three to five years experience, preferably mechanical, required in Montreal to develop equipment specifications, sources of supply for equipment and generally look after the routine of an engineering office. Salary open. Apply to File No. 1135-V.

DRAUGHTSMAN with five to ten years experience in plant layout, material handling equipment and some structural required by an electro-metallurgical plant located in Northern Ont. city. Salary open. Apply to File No. 1139-V.

The following advertisements are reprinted from last month's Journal having not as yet been filled.

CHEMICAL

JUNIOR CHEMICAL ENGINEER required by independent oil company located in Turner Valley. Duties will include design and supervision of maintenance and new construction work. Advancement will depend on initiative and readiness to assume responsibility. Salary open. Apply to File No. 1075-V.

CHEMICAL SALES ENGINEERS, one required in Montreal, one for Winnipeg. Graduates preferred. Positions offer excellent opportunity to develop to management. Salary depends upon qualifications. Apply to File No. 1092-V.

CHEMICAL ENGINEERS required by chemical company in Toronto for sales engineering. One recent graduate for training in sales also one with about one year's experience. Approximate starting salaries $200 to $225 per month. Apply to File No. 1097-V.

CHEMICAL ENGINEER with about one year's experience to carry out plant research work on product improvement. Position in Toronto. Approximate starting salary $225. per month. Apply to File No. 1097-V.

CHEMICAL ENGINEER required by large western industrial manufacturing concern. Applicant must be interested in boiler water treatment. Salary open. Apply to File No. 1103-V.

CIVIL

CIVIL ENGINEER required for a Consulting Engineers Practice in the Maritimes. Preferably with three to six years experience. Duties both design and field supervision of construction for both municipal works and industrial buildings. Engineering survey experience required. Salary open. Apply to File No. 1087-V.

CIVIL ENGINEER, age 35 to 40 years, required by Public Institution for Montreal area. Must have construction experience and be able to supervise large building program. Salary $6,000 to $7,000. Apply to File No. 1091-V.

*CIVIL ENGINEER to take charge of design and construction of service buildings, required by expanding chemical company in Western Ontario. Salary open. Apply to File No. 1111-V.

ELECTRICAL

ELECTRICAL DESIGNING DRAUGHTSMAN for work in Southern Ontario. Must be experienced. Salary up to $300. Apply to File No. 1059-V.

ELECTRICAL ENGINEER required as assistant to electrical superintendent by a textile manufacturing concern in Montreal. Applicant must have had good experience and be willing to accept responsibility. Salary open. Apply to File No. 1070-V.

ELECTRICAL ENGINEER with industrial background preferably pulp and paper required for senior position in electrical department of a paper mill in the Ottawa valley. Salary open. Apply to File No. 1073-V.

JUNIOR ELECTRICAL ENGINEERS required as assistants to Works Engineers by a large chemical manufacturing company with Headquarters in Montreal. Applicants should have passed the C.G.E. Test course. Positions in Ontario. Salary open. Apply to File No. 1084-V.

ELECTRICAL ENGINEER, recent graduate, required for Canadian branch plant of a progressive, established American company. Duties to be production control working closely with sales. Permanent position for right man with excellent opportunity for advancement. Location Toronto. Salary open. Apply to File No. 1088-V.

RECENT GRADUATE in Electrical Engineering required for Sales Engineering Work with old established Montreal firm. Must have had at least two years practical experience and be willing to travel occasionally. Apply to File No. 1094-V.

ELECTRICAL DESIGNING ENGINEER required for plant engineering department. Preferably between the ages of 30-40 years, with 10 years of electrical design experience in industrial plant construction and maintenance. Position in Ontario. Salary open. Apply to File No. 1100-V.

ELECTRICAL ENGINEER, preferably with experience in electrical trouble shooting and maintenance work required by industrial firm in Toronto. Salary open. Apply to File No. 1101-V.

ELECTRICAL ENGINEER required in Latin America as assistant to Manager on Public Utility system. Must have broad experience in operation and maintenance of generating plants, substations, transmission lines and distribution systems. Ability to speak Spanish desirable but not essential. Salary open. Apply to File No. 1112-V.

MECHANICAL

MECHANICAL ENGINEER required by a large industrial plant in the East end of Montreal for product design work on mapor electrical appliances. We are prepared to offer definite advancement in a reasonably short period of time and salary will be based on potentiality rather than experience. Apply to File No. 1016-V.

MECHANICAL ENGINEER required as assistant to mechanical superintendent by a textile concern 35 miles southwest of Montreal. Must have had good experience and willing to accept responsibility. Salary open. Apply to File No. 1070-V.

MECHANICAL ENGINEER, experienced on design and construction of fine instruments wanted to take charge of small model shop in laboratory specializing on development of airborne radar and aerial survey and navigation aids, servomechanisms and computors. Advancement in rapidly expanding and progressive organization assured for capable engineer. Salary open. Apply to File No. 1074-V.

SENIOR MECHANICAL ENGINEER required by chemical company in Toronto to act as chief Engineer. Must be able to do process design work and prepare capital cost estimates. Approximate starting salary $400 per month. Apply to File No. 1097-V.

MECHANICAL ENGINEER required as Plant Engineer by a pulp and paper mill in the Province of Quebec. Should have about ten years experience the major part in the pulp and paper industry. Applicant will be required to take complete charge of maintenance department consisting of various trades crews with a total personnel of about 250 men. Salary open. Apply to File No. 1099-V.

MISCELLANEOUS

GRADUATE ENGINEER required by Montreal head office of a large Canadian Company for design, specification and layout of air conditioning, ventilating, fan and duct work for industrial processes, factories, offices, dust removal collecting systems, etc. Supervision of field installations, testing and making estimates. Must be familiar with all kinds of relative apparatus and equipment and with sheet metal air duct work. At least five years' experience with the above. Please give full details of experience, training, age, references, salary expected and date available. Apply to File No. 1015-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experience in installations of production and cost control. Wage incentives etc. Free to travel. Preferably bilingual. Salary open. Apply to File No. 1058-V.

SALES ENGINEER 24 to 30 years of age, preferably single and free to travel required by Canadian manufacturer of industrial rubber products. Must have a minimum of 1 to 2 years post-graduate experience in mining or plant maintenance. Salary open. Apply to File No. 1060-V.

RECENT GRADUATE preferably mechanical or electrical background required by National Beverage Company. Training period in Montreal. Salary open. Apply to File No. 1069-V.

ELECTRONICS ENGINEER and Technicians experienced on design and construction of radar, servomechanisms, computors or magnetometers required for development laboratory specializing in airborne devices for aerial survey and navigation. Advancement in rapidly expanding and progressive organization assured for capable personnel. Salary open. Apply to File No. 1074-V.

SENIOR TIME STUDY MEN required by large National Organization in Ontario. Must be competent in methods improvement and have experience in developing standard data on machine tool and other operations. Salary open. Apply to File No. 1078-V.

*JUNIOR ENGINEER OR ARCHITECTURAL DRAUGHTSMAN for city planning office in Western Canada. State education, experience, age and salary desired. Apply to File No. 1080-V.

*GRADUATE CIVIL ENGINEER or ARCHITECT required for Saskatchewan community, about 6,000 population, to act as town planner under consultant, and as assistant to City Engineer. Interest in civic problems desirable. State education, experience and age. Apply to File No. 1080-V.

INDUSTRIAL ENGINEERS, must be fluently bilingual, two residents of Quebec City, one Bois Franc Region, one Grand'Mere, five Montreal, wanted by New York firm of Management Consultants, members of American Management Association contemplating to organize a branch in the Province of Quebec. Salary, Commission and travelling expenses. Apply to File No. 1083-V.

GRADUATE ENGINEER required as sales promotion Manager by well established manufacturer of heating equipment used in all types of buildings. Age 30 to 40 years with experience in selling Mechanical equipment in the construction industry and preferably with Business Administration Course. Salary open. Apply to File No. 1085-V.

* Closed since appearance in March Bulletin.

JUNIOR SALES ENGINEER, preferably bilingual, to be trained for sales work with Montreal Industrial Company. Salary open. Apply to File No. 1086-V.

AIRCRAFT STRESS ENGINEERS AND DESIGN DRAUGHTSMAN required by Canadian company. Must have aircraft design experience or at least two years experience in stressing of aircraft structures. Salary open. Apply to File No. 1089-V.

GRADUATE ENGINEER, 30 to 40 years of age with 3 or 4 years experience in railroad engineering required in Montreal to take charge of railway division. Must be bilingual. Salary open. Apply to File No. 1090-V.

GRADUATE ENGINEER preferably electrical or mechanical required to fill the position of Assitant Superintendent of the Street Railway Department of a Saskatchewan city. Salary around $3,600 per year. Apply to File No. 1093-V.

SALES ENGINEER for contractors equipment and allied lines required by large manufacturer, Niagara Peninsula. Salary open. Apply to File No. 1095-V.

HEATING AND VENTILATING ENGINEER with some experience in mechanical equipment for buildings, is wanted for office work on heating, ventilating and air conditioning by firm of consulting engineers in Montreal. Salary open. Apply to file No. 1096-V.

CHEMICAL ENGINEER OR CHEMIST with some experience in the manufacture of pulp, paper and converted products required for Province of Quebec to take charge of the testing staff of a sub-section of the technical dept. under the general direction of the Technical Superintendent. Salary open. Apply to File No. 1098-V.

*GRADUATE ENGINEER with management ability, about forty-five years of age required by Industrial Corporation operating several branches. Experience should cover plant lay-out, production planning, job simplification, warehousing and supervision of personnel. Salary open. Apply to File No. 1102-V.

GENERAL OPERATING SUPERINTENDENT required by large electric utility company in the Far East for three large interconnected hydro - electric generating plants. Applicants must be thoroughly experienced in operation and maintenance of hydro-electric generating equipment. Salary open. Apply to File No. 1112-V.

DISTRIBUTION ENGINEERS required in Latin America must have at least five years experience on design and operation of overhead electric distribution systems. Salary open. Apply to File No. 1112-V.

SALES ENGINEER, required by large manufacturer of industrial products and building materials with offices in Montreal to reside in Sydney, N.S., and contact industrial accounts, building materials dealers and contractors in Cape Breton and Nfld. Experience in steel and/or chemical engineering an advantage but not essential. Salary open. Apply to File No. 1113-V.

Situations Wanted

MECHANICAL ENGINEER, M.E.I.C., University of Toronto, Canadian Citizen, experience in Canada and abroad, knowledge of several languages. Desires contacts in view of changing the actual line of work with better salary. 37 years of age, married with small family. Great practical and theoretical knowledge in Thermodynamics, hydraulics, aircraft and furniture making and finishing, also all systems of production control. Minimum salary accepted $7,000 per year. Apply to File No. 140-W.

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Queen's, age 49. Five years hydro-electric power development construction, one year industrial building construction, two years sales engineer and estimator architectural ironworks concern, fourteen years oil refinery on initial construction, on operations and maintenance, last six years refinery engineer in charge of maintenance safety, equipment inspection, design and construction of plant changes and extensions, industrial buildings. Resigned to undertake private venture. Desires to re-enter industry. Apply to File No. 166-W.

MECHANICAL ENGINEER, age 39, experienced in tool design and production methods, material selection, production records, control and co-ordination. Desires employment preferably in Montreal with either manufacturer or firm of Engineers who could utilize all or a part of above experience. Apply to File No. 551-W.

ELECTRICAL ENGINEER, Jr. E.I.C., Manitoba, '44, married, age 27. Presently situated in Maritimes desires active position in Central or Western region. Field service engineering, C.G.E. test course, Army radar experience. Interested in plan engineering, installation or development openings. Apply to File No. 846-W.

GRADUATE MECHANICAL ENGINEER (McGILL), M.E.I.C., P.Eng.Ont. 26 years experience including oil refinery design, plant layout, structural design, pressure vessels; central station boilers and furnaces both design and specifications; surveys and reports on power plant and factory efficiency problems, inspection of installations, and supervision of maintenance on heating, ventilation and air conditioning of military and airport buildings, and fuel storage depots. War veteran, employed but desires remunerative responsible position on West Coast. Would consider partnership with consulting firm. Apply to File No. 991-W.

ELECTRICAL ENGINEER, M.E.I.C., P.E.Q., B.Eng., McGill '34, age 40, married, Bilingual. 15 years Sales and Service of industrial electrical and welding equipment. At present in charge of Sales and Administration for Canadian company. Desires position of responsibility with well established progressive company. Location preferably Quebec or Ontario. Home in Montreal. Available on short notice. Apply to File No. 1421-W.

CIVIL ENGINEER, S.E.I.C., P.Eng. Que., B.Sc., doing post graduate study in Montreal requires part time employment preferably weekends at home. Experienced in various steel plate construction designs. Will also accept draughting and miscellaneous engineering work. Apply to File No. 1487-W.

GRADUATE CIVIL ENGINEER, M.E.I.C., P.Eng., Que. Experience in the Engineering Department of large Corporations. Considerable experience in Hydraulic and design and building of Reinforced concrete structures. Several years as Construction and Field Engineer on various plants and Hydraulic Power Projects. Desire position with well established firm. Presently employed. Apply to File No. 1527-W.

MECHANICAL ENGINEER, M.E.I.C., McGill 1940. Age 33, Married. Experienced in plant and canal construction, shop work and shop management, cost estimating and control, aircraft maintenance and design. Previous positions include company chief inspector and assistant superintendent. Seeking responsible position in Montreal area. Available three weeks notice. Apply to File No. 1586-W.

SALES ENGINEER, B.E. (Electrical). N.S.T.C., M.E.I.C., Professional Engineer Nova Scotia, age 35, married. Presently employed in Halifax. Ten years experience successfully selling, and supervising the selling of, a variety of electrical equipment. Excellent contacts in Maritime Provinces and Newfoundland. Interested in position as branch manager, or district representative in Maritimes, on salary and commission. Would also consider being manufacturer's agent. Apply to File No. 1758-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Ontario, age 38, married. 14 years extensive structural experience in reinforced concrete and structural steel design and layout. Interested in association with well established progressive organization as Engineering Assistant or Chief Draughtsman. Present salary $5,000. Apply to File No. 2049-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C.. Background of Engineering, production, Business Organization, Cost Control, and Management. Age 37, married, and preference for permanent association with enterprise in Montreal area. Apply to File No. 2228-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. (Alta.). Age 29, B.Sc. Married. Presently employed. Experience in light commercial construction and housing projects. Familiar with project planning and utility layouts. Have organized and supervised several large construction projects, have good background in lumber and building supply business relative to the construction industry. Some experience in highway location and construction, sewer and water distribution and natural gas installations. Interested in partnership with consultant engineer or architect, or position with progressive construction firm, would consider oil company. Home Edmonton, Alberta. Apply to File No. 2521-W.

PARTNER wanted by engineer, M.E.I.C., with 25 years experience, contemplating private practice. Must have necessary qualifications; previous experience with consulting engineer desirable. Apply to File No. 2642-W.

GRADUATE CIVIL ENGINEER, M.E.I.C., P.E.Q., with seven years intensive work with large pulp and paper mill, construction, maintenance, estimate, layouts, process development, time study, etc., also experience in public work-management: water, sewer, electric system generation, transmission and distribution with full responsibilities of design and work, etc. Services available at short notice. Age 32, married and bilingual. Apply to File No. 2823-W.

ENGINEERING PHYSICIST, Jr.E.I.C., Sask. '47, age 24, Prof. Eng. Ont. Single. Desires research work in progressive company. Preferably in Ontario or West. Experience includes six months outside plant of Bell Telephone, Montreal. 14 months ass't Engineer with Miniature Electric Motor Manufacturing Company. Duties are Research and test of design and materials plus plant control and maintenance. Presently employed, available one month's notice. Apply to File No. 2917-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc. Queen's. Age 32. Married. Veteran. Navy Engineer Officer. Experience primarily includes heating and power plant design, estimating construction and maintenance. At present employed but desires change to responsible position in Ontario, British Columbia or Alberta. Apply to File No. 3020-W.

MECHANICAL ENGINEER, M.E.I.C., Prof. Eng. (Quebec), 15 years of shop practice in maintenance and locomotive repair; 5 years machinery design, including welded vessels, process piping and pulp mill layout. Seeking responsible position preferably in Montreal area. Available on short notice. Apply to File No. 3045-W.

PART TIME WORK, Graduate Civil Engineer, B.A., Sc., Jr.E.I.C., now doing graduate work in Montreal. Desirous of obtaining part time work in concrete and steel design or cost estimating. Apply to File No. 3073-W.

GRADUATE MECHANICAL ENGINEER, 39, single, 14 years experience in research engineering, instrumentation, automatic controls, testing of materials and machinery. Knowledge of metallography, heat-treatment, and welding. Several languages. Acquainted with optical and electrical equipment, emergency maintenance of plant and motor transport. Desires suitable position requiring initiative. Apply to File No. 3074-W.

MECHANICAL ENGINEERING STUDENT, S.E.I.C., 2nd year at McGill University, member, Society of Motion Picture Engineers, age 21, single. Interested in obtaining summer employment with prospects of permanent position in precision mechanical engineering field (instruments, meters, motion picture equipment). Machine shop experience, languages. Apply to File No. 3076-W.

GRADUATE ENGINEER, Toronto '42, M.E.I.C., P.Eng. (Civil Branch), age 30. Married. Overseas veteran with R.C.E. M.E. Experience in Mining and Metallurgy. Presently engaged in all phases of railroad construction and maintenance of way including estimating, general design and layout work. Desires change to position of professional responsibility in Municipal Engineering or Industrial work in smaller firm. Preferable location Toronto or neighborhood. Now completing two year course in Business Methods. Apply to File No. 3077-W.

CIVIL GRADUATE, S.E.I.C., B.Sc. Queen's. Age 25, married, a veteran. Experience limited to survey work and varied shop experience. Desires a position with a consultant or with a town planner. Available on short notice. Apply to File No. 3078-W.

* Closed since appearance in March Bulletin.

Building Research

Engineers and Architects interested in the application of research to building and associated engineering problems are invited to enquire about employment possibilities with the newly formed Division of Building Research of the National Research Council. An enquiring mind is an essential; experience in building work in Canada is really necessary; bilingualism would be helpful. Salaries depend upon training and experience; opportunities for useful work are unlimited. Enquiries should be addressed to the Director, Division of Building Research, National Research Council, Ottawa.

SALES ENGINEER, M.E.I.C. Electrical and Mechanical background, bilingual, 12 years service in Navy and 6 years with Wartime Shipbuilding and War Assets in technical and executive capacity. Interested in representing Firm in Montreal area. Available immediately. Apply to File No. 3081-W.

MECHANICAL ELECTRICAL ENGINEER, S.E.I.C., graduating in May from Ecole Polytechnique seeks position with progressive industrial firm. Age 26, single. Good Mechanical background. Employed during war with National Research Council. Ambitious, with good character and potentialities. Apply to File No. 3083-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc., Prof. Eng. Age 33. Married no children, bilingual, seven years experience in the following fields: one year in hydro-electric power house operation, three years planning and supervision in shipbuilding, two years in design and supervision of irrigation works; one year as Construction Engineer in charge of the Construction of a dam. Available in June 1949. Presently employed in Ceylon. Apply to File No. 3085-W.

WANTED

MANAGER'S ASSISTANT FOR ELECTRICAL DISTRIBUTION SYSTEM IN FAST-GROWING TOWN OF 25,000 POPULATION

Applicant must be a Professional Electrical Engineer, be between 35-40 years old, have had a minimum of five years experience with a Public Utility or related industry. Please supply resume of experience, photo and expected salary in initial reply.

Apply: File No. 1124-V.

CHEMICAL ENGINEER, Jr.E.I.C., B.Sc. Queen's '46, Professional Engineer (New Brunswick), age 26, married, reliable and conscientious. Experience includes product control, piping layout and general engineering in Pulp and Paper and Petroleum Industry. Also held responsible position in sanitary engineering field as district engineer-in-charge. Desires responsible position in industry or with consulting engineer. Available immediately. Apply to File No. 3092-W.

PROFESSIONAL ELECTRICAL ENGINEER, A.M.I.E.E., seeks position where expert knowledge of motor control gear, motors, switchgear, cables, etc. is required. Wide experience in applications, field and makers tests, layout, specifications, purchase and installation of controls. Would consider engineer-representation of reputable firms. Apply to File No. 3095-W.

STUDENT in 4th year Civil Engineering U. of T., S.E.I.C., graduating this spring, desires a position with an engineering consulting firm doing design or research work in steel, reinforced concrete, or timber structures. 28 years of age, R.C.A.F. veteran, married, one child. Apply to File No. 3096-W.

CIVIL ENGINEER, S.E.I.C., B.Sc. Sask. '48. Age 25, single, veteran. Desires foreign employment. Experience in municipal engineering construction, surveying and geophysical work. Available one month. Apply to File No. 3104-W.

CIVIL ENGINEER, S.E.I.C., E.I.T. (B.Sc. Alta.), age 29. Married. Presently employed in construction supervision, design and estimating. Experienced in highway and municipal works, surveys and layout. Four and one half years overseas artillery survey experience. Desires a permanent position with a consultant or other engineering firm in Western Canada. No objection to travel in connection with field work. Available on reasonable notice to present employer. Apply to File No. 3106-W.

MECHANICAL ENGINEER, M.E.I.C., age 35, married, excellent health. Four years practical mining experience, three years woods operations. Presently employed in woods mechanization program. Three years army experience, automotive repair and maintenance. Desires work in maintenance, or sales and supervision of field installations, testing and making estimates. Apply to File No. 3115-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Eng. (McGill) 1944. Married. 26 years of age, one child. Army service in R.C. Signals. Post-graduate training in Radio Physics at the University of Western Ontario. At present employed as Assistant Professor of Physics at a Maritime university. Interested in research or development in radio, electronics or allied fields. Preferably Montreal or Ottawa area. Apply to File No. 3127-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., Toronto, Veteran, age 27, Married, graduating this spring, desires employment commencing about May 1st. Will consider anything, but primarily interested in reinforced concrete and structural steel design work in Southern Ontario. Apply to File No. 3128-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., Graduating in May 1949, from University of British Columbia. Age 23, married, veteran. Experience limited to survey work. Desires experience with a consultant or with large design and construction company. Available after May 15th, 1949. Apply to File No. 3129-W.

GRADUATE ENGINEER, Jr.E.I.C., age 32, married, desires position leading to increased responsibility in railway or its equivalent field. B.Sc. Eng. (Electrical) University of Manitoba ('44), two years Engineer Officer Royal Canadian Navy operating and repair of Steam turbines and diesel electric generators, nine years railway machine shop, one year detail and design of welded pressure vessels, steam generators. One winter a lecturer in mechanical engineering. One year in railway signal engineering on signal layout, installation, circuit design. Apply to File No. 3130-W.

MANAGER OF MANUFACTURING

required by Canadian mill producing 500 tons per day of Specialty Papers, Tissues, Paperboard and Newsprint. Position requires proven managerial ability and technical qualifications for the production of paper. The location is most desirable and salary attractive. Applications giving all essential information will be kept confidential if desired — and should be addressed to

File No. 1140-V.

MECHANICAL ENGINEER, Saskatchewan, 1946, Jr.E.I.C., married, age 25. Presently located in Winnipeg area, desires permanent position in industrial or plant engineering. Experience includes teaching, construction, sales, equipment design and installation. Available May 1st, 1949. Apply to File No. 3131-W.

EXECUTIVE, B.A.Sc., P. ENG., M.E.I.C. Wide managerial experience in all phases, Development, Production, Sales, Organization, Cost Control. Age 39. Married, family. Willing to consider position with established concern requiring senior executive. Apply to File No. 3138-W.

ELECTRICAL ENGINEERS

with 7 to 15 years' experience on design, estimating and layout of medium large and large high voltage sub-stations.

ELECTRICAL ENGINEERS

as resident engineers with 5 to 10 years' experience in construction of high voltage sub-stations and hydro-electric generating stations.

ELECTRICAL ENGINEERS

with 5 to 10 years' experience in design and construction of wood and steel tower power lines.

ELECTRICAL ENGINEERS

with 5 to 10 years' experience in design and construction of distribution systems. Location Toronto and elsewhere in Ontario, Canada.

Apply, stating professional qualifications and experience to File No. 1109-V.

ATTENTION EMPLOYERS!

News of the Branches

(Continued from page 167)

In closing, the speaker stated that increased expenditures, much greater than present costs of 21 cents per capita, are needed to hasten the survey programme. At present the Provincial Air Survey Library has a copy of every photo ever taken either by the Government or the R.C.A.F. and these are available for public use.

Mr. D. Roy thanked the speaker on behalf of the Institute.

Winnipeg

G. W. Moule, M.E.I.C.
Branch Secretary

Electrical Section

J. C. Pratt, M.E.I.C.
News Editor

George E. Creed, chief motor design engineer of the Canadian Westinghouse Co., Hamilton, was the guest speaker at the annual meeting of the Electrical Section, February 3, in Winnipeg. Mr. Creed's subject was **Picking the Right Induction Motor for the Job.**

The address covered the electrical modifications, types of protection, and mechanical modifications of polyphase motors from ½ to 5000 horsepower. It was pointed out that Canadian manufacture follows N.E.N.A. Standard dimensions for polyphase induction motors in order to effect interchangeability of American and Canadian motors. Slides were used to illustrate the various motor types. An informal discussion followed, after which W. A. Trott of Greenlaw and Trott moved a vote of thanks to Mr. Creed which was heartily approved by the gathering. The meeting then adjourned to the "Snack Shop" for refreshments.

CHANGING YOUR ADDRESS?

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

Pulling Back the Curtain on an Engineer's Family Life

CHEAPER BY THE DOZEN

Frank B. Gilbreth, Jr., and Ernestine Gilbreth Carey. New York, T. Y. Crowell Co., 1949. Illus., 8 x 6 in., cloth, $3.75.

Although this book will be of wide general interest it has a special call to engineers. It tells the inside-the-home story of two outstanding members of the profession — and tells it well. There are many amusing pictures of the efficiency engineer's ideas applied to the family, but in general the great professional success of one of the world's earliest and most successful "time and motion study" engineers, is not part of the story. The home life account is one of the best family sagas that has been offered to the public. Every engineer should read it — particularly if he has children.

The book is funny, not just amusing — really downright hilariously funny. The Gilbreths have twelve children six boys and six girls — all as agreed upon in advance by these efficiency experts. Mr. Gilbreth must have been a remarkable character — big, dynamic, impulsive, kind, afraid of nothing and of nobody, full of the love of life, the love of his work and most of all the love of his family.

Although the book is full of riotous nonsense there are two threads which run through it pointing up two all important principles — the value of a happy home life and the recognition that education can be taught as a game. Mr. Gilbreth never neglected a meal or other family assembly as an opportunity for fun and games — but helpful games. Almost without knowing how it came about all the children down to six years of age learned among other things how to write on a typewriter quickly and accurately by the touch system in two weeks time, how to do mental arithmetic as fast and as accurately as an adding machine and how to receive and transmit messages in Morse. They could all square any and every number from one to fifty, in their heads. It was a trick method that brought consternation to many people but great fun and amusement to the family, particularly "father".

Another reviewer is quoted herewith in his reference to the terrible Pierce Arrow ("the tin you love to touch") which was a colourful part of the Gilbreth life. "Only a motion-study expert could have coped with their temperamental Pierce Arrow. But Dad found no difficulty in blowing all three horns (one electric, two of the bulb variety) as he stepped on the gas, steered madly through traffic, puffed on his cigar, cuffed a noisy youngster in the back seat, and bellowed, "Road hog, road hog", at the unwary.

"The annual trip to their summer home in Nantucket, Massachusetts, was always fraught with drama. They inevitably caused a sensation when they passed through a small town, and were once taken for an entire orphanage on an outing. Stops were of course, frequent and once when one of the twelve got left behind, the loss was not discovered for several hours.

"Democracy was religiously practised in the Gilbreth family through the medium of the family council. There was the matter of the dog, for instance. Dad firmly believed that 'any pet which didn't lay eggs was an extravagance that a man with twelve children could ill afford'. But the vote was twelve to one, with Mother abstaining, and the dog was added to the general bedlam.

"The Gilbreths astounded the Nantucket natives (who considered the Gilbreth homestead — a pair of lighthouses with a cottage squeezed between — a must stopping place for visiting tourists), paralyzed the Montclair schools, and routed the visiting psychiatrists. Their high jinks are faithfully reported by two of the famous dozen in this uproarious book."

The story is of particular interest to members of the Institute as Mrs. Gilbreth (Dr. Lillian Gilbreth, B.Litt., M.Litt., Ph.D., M.Eng., D.Eng., Sc.D.(2), LL.D.(2), in chronological order) is to be a luncheon speaker at the Annual Meeting in Quebec. After Mr. Gilbreth's sudden death she carried on the consulting practice with great success and put everyone of the twelve children through university. In the book, she is played down in favour of "father" but there is a significant note in the preface. It reads "she (Mother) is still active today after rearing twelve children—but that's another story". And so it should be—and what a delightful one it will be.

If the reader of this review wants to be good to himself he should read "Cheaper by the Dozen" and then come to Quebec and hear "mother" speak on "Human Engineering in Management". Each will be a memorable event in his life.

L. A. W.

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS. PAPERS:

Some Projects Favourable to Direct Current Transmission and the Role of the British Electrical Industry in Relation thereto:

F. J. Errol and The Lord Forrester.

Transmission by direct current can be of service in the development of new energy resources. Possible research projects are discussed, and an outline of a major transmission project in each of four continents is given.

Substations, with Particular Reference to Yorkshire Practice:

L. H. Fuller and C. R. Clarke.

Describes substation practice in a large area of Yorkshire where considerable progress has been made in supplying the sparsely populated sections as well as the larger industrial installations. Details are given of designs at 66 kV. and 11 kV., and slides and models are shown, with special reference to 11 kV. cubicles and 11 kV. kiosk substations.

Theory and Design of Magnetic Amplifiers:

H. M. Gale and P. D. Atkinson.

Basic circuits and characteristics of magnetic amplifiers are reviewed. Mathematical analysis can produce a solution showing that the steady state and transient operation of an amplifier depend on only three dimensionless coefficients. This solution leads to methods of determining the steady state current and flux waveforms and the response to sudden changes in input.

Polyphase Commutator Machines:

B. Adkins and W. J. Gibbs.

There are three types—the shunt and series motors, the commutator frequency changer, and the Scherbius machine. The paper describes the practical arrangement of each type of machine and the associated regulating apparatus, and explains the general effect on performance. The theory of all these machines can be derived from that of a slipring induction motor which has a slip frequency voltage injected into the secondary winding.

Selection of Transformers for Use in Distribution Networks, with Particular Reference to the New Standard 240 Volts:

E. Tobin.

Discusses voltage, ratio, tappings, and economic size of standard transformers, with a few notes giving the permissible duration of overloads starting with a known oil temperature and air temperature.

Insulators to Withstand Air-Borne Deposits:

J. J. Taylor. (American Institute of Electrical Engineers. Preprint.)

Representative types of fog insulators are classified according to design principles. The general conclusion is that each type has inherent limitations and that a completely satisfactory solution of the problem is still to be found. The mechanism of leakage surge flashover is examined. Continued research into methods of establishing a voltage gradient by resistance means is recommended. In such research, leakage surge counters promise to be a useful tool. A description is given of surge measuring equipment and of results obtained on one group of outdoor tests.

New Type of Cast Iron—Nodular Graphite Iron:

J. G. Pearce. (V. 1349. British Cast Iron Research Association.)

Nodulite is a new engineering material evolved by the British Cast Iron Research Association. It is a grey cast iron, as-cast, and without heat-treatment, having the graphite content in the nodular or spherulitic form. The process yielding this product consists essentially in adding a small amount of cerium (available commercially in the form of mischmetal) to a particular type of base iron, best met by a low phosphorus pig iron. The form of the process favoured by the Association consists in the addition to the molten metal in the ladle of a predetermined amount of mischmetal, followed by a ladle graphitiser, when the phosphorus content of the metal does not exceed 0.5%. In the ordinary unalloyed state the material is extremely soft and machinable. It can be produced with virtually any metallurgical structures in the metal, and the use of alloying elements or heat treatment to improve the strength of the metal structure by the usual procedures can be followed. Figures are quoted to give some idea of the properties of these cerium-treated irons.

Use of a Technical Library:

R. H. Whitford and J. B. O'Farrell. (In Mechanical Engineering, volume 70, number 12, December 1948. p. 987-993.)

Scientific publications of wide variety are being issued so prolifically that even the most zealous reader can keep abreast of progress within but a narrow field. It is highly essential, therefore, to acquire familiarity with efficient search techniques, for the specialist today must not only know, but know how to find. Accordingly, this article outlines suitable procedures for locating data in the various forms of technical literature, such as books, serials, journals, government publications, and trade catalogues, each type being described from the standpoint of subject material and its availability through skilful use of bibliographical tools.

SELECTED ADDITIONS TO LIBRARY

TECHNICAL BOOKS, ETC.

Aeronautical Conference, London, 3rd-5th September, 1947:

Convened by The Royal Aeronautical Society and The Institute of the Aeronautical Sciences, edited by J. L. Pritchard and Joan Bradbrooke. London, Royal Aeronautical Society, 1948. 704 p., illus., cloth.

Chamber's Four-Figure Mathematical Tables:

L. J. Comrie. Edinburgh, London; Chambers, 1947. 64 p., cloth.

Chemistry and Technology of Enzymes:

Henry Tauber. New York, Wiley; London, Chapman and Hall, 1949. 550 p., illus., cloth.

Design for Welding:

Edited by R. S. Green, D. C. Williams, C. B. Smith. Cleveland, Ohio, James F. Lincoln Arc Welding Foundation, 1948. 1024 p., illus., fabrikoid.

Elementary Structural Problems in Steel and Timber, 3rd ed.:

C. R. Young and C. F. Morrison. New York, Wiley; London, Chapman and Hall, 1949. 329 p., illus., cloth.

First Course in Mathematics for Students of Engineering and the Physical Sciences:

Edward Baker. New York, London, Toronto; Van Nostrand, 1943. 295 p., illus., cloth.

Functions of the Executive:

C. I. Barnard. Cambridge, Mass., Harvard University Press, 1948. 334 p., cloth.

Gas Turbines and Their Problems:

Hayne Constant. London, Todd Publishing Group; Toronto, Clarke Irwin, 1948. 158 p., illus., cloth.

Heating and Ventilating's Buyers' Directory, 1949 ed.:

Industrial Press, Chicago, 1949. 236 p., illus., paper.

Industrial Electronics and Control:

R. G. Kloeffler. New York, Wiley; London, Chapman and Hall, 1949. 478 p., illus., cloth.

Instrumental Methods of Analysis:

H. H. Willard, L. L. Merritt, Jr., J. A. Dean. New York, London, Toronto; Van Nostrand, 1948. 247 p., illus., paper.

Introduction to Engineering Economics:

C. R. Young. Toronto, University of Toronto Press, 1949. 160 p., illus., cloth.

M.M. Year Book, 1949:

Machinery Market, London, 1949. 484 p., illus., cloth.

Management and the Worker; an Account of a Research Program conducted by the Western Electric Company, Hawthorne Works, Chicago:

F. J. Roethlisberger, W. J. Dickson, H. A. Wright. Cambridge, Mass., Harvard University Press, 1947. 615 p., illus., cloth.

Manual of Design for Arc Welded Steel Structures:

LaMotte Grover. New York, Air Reduction, 1947. 281 p., illus., fabrikoid.

National Advisory Committee for Aeronautics University Conference on Aerodynamics:

Langley Aeronautical Laboratory, Langley Field, Va., June 21-23, 1948. Compilation of the Papers Presented: National Advisory Committee for Aeronautics. Pasadena, Calif., California Institute of Technology, 1948. 411 p., illus., paper.
California Institute of Technology, 1948. 411 p., illus., paper.

Oil Shales and Shale Oils:

H. S. Bell. New York, London, Toronto; Van Nostrand, 1948. 157 p., illus., fabrikoid.

Partners in Production; a Basis for Labor-Management Understanding:

Labor Committee of the Twentieth Century Fund, assisted by Osgood Nichols. New York, Twentieth Century Fund, 1949. 149 p., cloth.

Physics, 3d ed.:

Erich Hausmann and E. P. Slack. New York, London, Toronto; Van Nostrand, 1948. 793 p., illus., cloth.

Practical Analysis; Graphical and Numerical Methods:

Fr. A. Willers, translated by R. T. Beyer. New York, Dover Publications, 1948. 422 p., illus., cloth.

Rocket Propulsion Elements; an Introduction to the Engineering of Rockets:

G. P. Sutton. New York, Wiley; London, Chapman and Hall, 1949. 294 p., illus., cloth.

Royal Canadian Institute Centennial Volume, 1849-1949:

Edited by W. S. Wallace. Toronto, Royal Canadian Institute, 1949. 232 p., illus., cloth.

Scientific Foundations of Vacuum Technique:

Saul Dushman. New York, Wiley; London, Chapman and Hall, 1949. 882 p., illus., cloth.

Semi-Fireproof Construction:

H. R. Staley. New York, London, Toronto; Van Nostrand, 1948. 327 p., illus., cloth.

Steam Boiler Yearbook and Manual (IV):

S. D. Scorer. London, Elek, 1948. 589 p., illus., cloth.

Structure of Matter:

F. O. Rice and Edward Teller. New York, Wiley; London, Chapman and Hall, 1949. 361 p., illus., cloth.

Technical Descriptive Geometry:

W. E. Street. New York, London, Toronto, Van Nostrand, 1948. 179 p., illus., cloth.

Textbook of Geomorphology, 2d ed.:

P. G. Worcester. New York, London, Toronto; Van Nostrand, 1948. 584 p., illus., cloth.

Tool Steel Simplified; a Handbook of Modern Practice for the Man who Makes Tools, rev. ed.:

F. R. Palmer and G. L. Luerssen. Reading, Pa., Carpenter Steel Company, 1948. 564 p., illus., cloth.

TECHNICAL BULLETINS, ETC.

American Institute of Mining and Metallurgical Engineers. Technical Publications:

No. 2366—High Strength-High Conductivity Copper-Silver Alloy Wire, W. Hodge, R. I. Jaffee, and others.—No. 2393—Cobalt-Chromium Binary System, A. R. Elsea, A. B. Westerman, and others.—No. 2399—Thermal Drying of Fine Coal, O. R. Lyons, and A. C. Richardson.

Bell Telephone System. Technical Publications. Monographs:

B-1560—On Hearing in Water versus Hearing in Air, L. J. Sivian.—B-1563—Strength Tests of Wood Crossarms, R. C. Eggleston.—B-1568—Mercury Vapor Jets Produced by Sparks, J. R. Haynes.—B-1570—Mechanical Properties of Long Chain Polymers.—B-1574—Transistor and Related Experiments, J. Bardeen, W. H. Brattain, and others.—B-1575—Arithmetic of Bell and Stirling Numbers, J. Riordan and H. W. Becker.—B-1576—Representation of Vowels and their Movements, R. K. Potter and G. E. Peterson.—B-1577—Directivity Index for Various Types of Radiators, C. T. Molloy.—B-1578—Time Integral Basic to Optimum Reverberation Time, J. P. Maxfield.—B-1579—Pure Rotational Spectrum of ICl, C. H. Townes, F. R. Merritt, and B. D. Wright.—B-1580—Reactions of Zirconium with Gases at Low Pressure, W. G. Guldner and L. A. Wooten.

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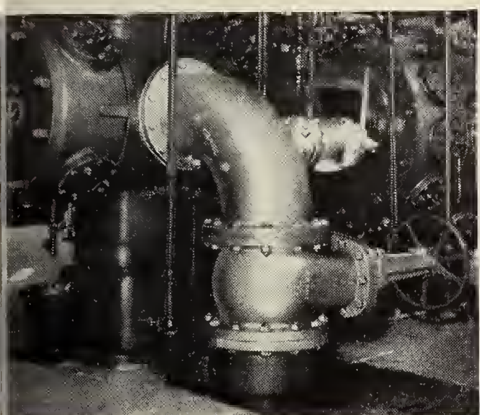
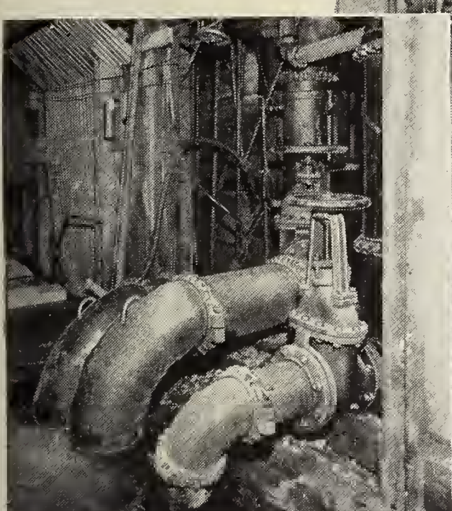
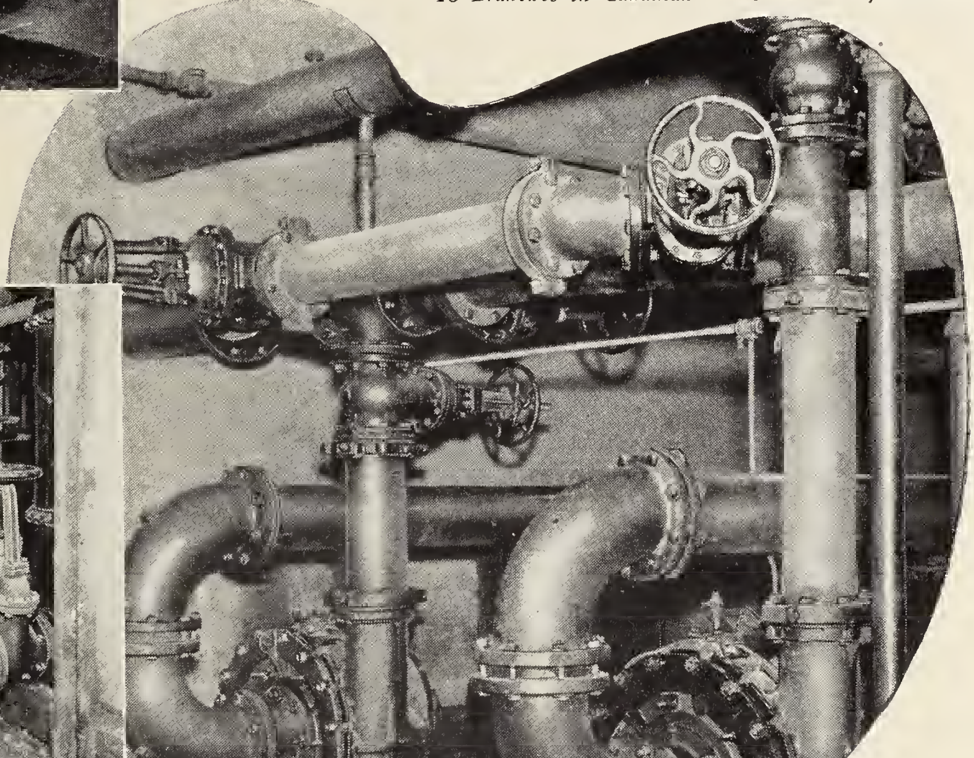


MINE COMPRESSOR *power house, showing Crane iron double-disc gate valve, safety valve, and flanged fittings.*



DRAINAGE WATER STORAGE *at mid-level in deep pit where Crane piping materials are giving outstanding service under severe conditions.*



SLUDGE PUMPS *in coal plant, pumping to sludge dam. Iron body gate valves, fittings and pipe from the complete Crane line.*

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Canada. Bureau of Mines. Publications:

No. 825—Summary of Investigations on New Brunswick Oil Shales, conducted by the former Mines and Geology Branch, Department of Mines and Resources, under agreement with the Province of New Brunswick, 1942.

...Division of Fuels. Memorandum Series:

No. 97—Physical and Chemical Survey of Coals from Canadian Collieries (Number Five)—Alberta-Drumheller Coalfield.

Canada. Dominion Water and Power Bureau:

Hydro-electric Progress in Canada during 1948.

Institute of Metals. Reprints:

Cavendish Laboratory, Sir Lawrence Bragg.—Constitution of Aluminum-Manganese-Magnesium and Aluminum-Manganese-Silver Alloys, with Special Reference to Ternary-Compound Formation, D. W. Wakeman and G. V. Raynor.—Constitution of Tin-Rich Tin-Antimony-Copper Alloys, J. V. Harding and W. T. Pell-Walpole. Effect of Melting Conditions on the Spectographic Determination of Copper in Lead Alloys, L. C. Bannister and R. H. Price.—Priming Paints for Light Alloys, J. G. Rigg and E. W. Skerrey.

Institution of Electrical Engineers. Proofs:

Direct-Capacitance Aircraft Altimeter, W. L. Watton and M. E. Pemberton.—Double-Ratio A. C. Bridges with Inductively-Coupled Ratio Arms, H. A. M. Clark and P. B. Vanderlyn.—Small Power Transformers for Aircraft Electrical Equipments, A. L. Morris.—Some Aspects of the Design of Balanced Rectifier Modulators for Precision Applications, D. G. Tucker.—Substations, with Particular Reference to Yorkshire Practice, L. H. Fuller and C. R. Clarke.

Institution of Mechanical Engineers. Advance Copies:

Basic Problems in the Engineering of an All-Metal Motor Body, E. S. White.—Distribution of Load in Screw Threads, D. G. Sopwith.—Graticule Ruling in Australia, Mansergh Shaw.—Tensile Fillet Stresses in Loaded Projections, R. B. Heywood.

National Research Council:

Review, 1948.

North-East Coast Institution of Engineers and Shipbuilders. Advance Copies:

Tanker Design from a Stability Point of View, N. H. Burgess.—Vibration Diagnosis in Marine Geared Turbines, H. G. Yates.

Tin Research Institute. Publications:

Babbitt Alloys for Plain Bearings, P. G. Forrester.—How to Make Improved Chill Cast Tin-Bronzes.—Properties of Tin Alloys (except Bronze), L. T. Greenfield and P. G. Forrester.—Tin Research Institute and its Technical Service to Industry.

U.S. Beach Erosion Board. Technical Reports:

No. 3—Experimental Study of Submarine Sand Bars.

...Dept. of Commerce. Industrial Series:

No. 83—World Electrical Current Characteristics, G. B. Hall.

...Highway Research Board. Bulletins:

No. 13—Appraisal of Terrain Conditions for Highway Engineering Purposes.—No. 14—Soils Committee Reports and Special Papers.

STANDARDS, SPECIFICATIONS, ETC.

British Standards Institution. Standards:

BS 1306: Part 2: 1948—Seamless Copper Tubes for Steam Services.—BS 1461: 3: 1948 — Chromium-Molybdenum Steel Castings.—BS 1470: 1948—Wrought Aluminium and Aluminium Alloys: Sheet and Strip.—BS 1486: Part 1: 1948—Lubricating Nipples and Adaptors.—BS 1486: Part 2: 1948—Heavy Duty Lubricating Nipples.—BS 1489: 1948—Reels for Covered, Solid, Round, Electrical Winding Wire.

...Codes of Practice:

CP(B)809—Water Supply.—CP(B)814—Telephones and Telegraphs: Private Services.

Canadian Standards Association. Specifications:

CSA B89-1948—Specification for 1½ inch Fire Hose Coupling Screw Thread.—CSA C22.4 No. 102-1948—Tolerable Limits and Special Methods of Measurement of Radio Interference from Trolley Buses, Tramways and Electric Railways.—CSA C22.4 No. 103-1948—Tolerable Limits and Special Methods of Measurement of Radio Interference from High Voltage Lines and Apparatus.

PAMPHLETS, ETC.

Brazing, Soldering and Oxy-Acetylene Processes; a Survey of a Year's Literature:

R. W. Bennett. Columbus, Ohio, Battelle Memorial Institute, 1948.

How to Cut Small Boiler-Plant Costs by Mechanical Coal and Ash Handling:

Bituminous Coal Research, Inc., Washington, 1948.

Indo-Ceylon Coaxial Cable:

S. Rajanayagam. Engineering Association of Ceylon, 1948.

New Products and Services, 1949:

Journal of Commerce, New York, 1949.

Plastics in Aircraft—a Record and a Challenge:

L. E. Cheyney. Columbus, Ohio, Battelle Memorial Institute, 1948.

Remarks on the Engineer in Public Service:

J. L. Wickwire. Halifax, Nova Scotia Dept. of Highways and Public Works, 1948.

Society's Challenge to Technical Education; a Report of the Inauguration of T. Keith Glennan as President of Case Institute of Technology:

Case Institute of Technology, Cleveland, Ohio, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

AMERICAN STANDARDS ASSOCIATION. STANDARDS.

New York, the Institution, 1948.

Z38.4.19-1948 — Nomenclature for Parts of a Photographic Objective Lens. *25c.*

Z38.4.20-1948 — Methods of Designating and Measuring Apertures and Related Quantities Pertaining to Photographic Lenses. *25c.*

Z38.4.21-1948 — Methods of Designating and Measuring Focal Lengths and Focal Distances of Photographic Lenses. *35c.*

These standards define the focal length of the lens of a camera in more exact terms than has been the case up to the present time and provide methods of designating and measuring apertures of photographic lenses. The terms used in describing the parts of a lens are defined. The standards are part of a series sponsored by the Optical Society of America.

ASBESTOS; ITS PREPARATION AND APPLICATION:

A. E. Williams. Manchester, Emmott, 1948. 44 p., illus., 6½ x 4 in., paper, 2/6-.

In this Monograph the writer has endeavoured to review briefly the present-day methods of producing asbestos and its various products. Some of the better known of these products, such as roofing tiles, pipes, coatings for metal, gaskets, washers, packing, etc., are described.

BIBLIOGRAPHY ON PRESTRESSED REINFORCED CONCRETE:

Engineering Societies Library, New York, 1948. 25 p., 11 x 8½ p., paper, $4.00. (ESL Bibliography No. 2.)

Covering all aspects of the subject, including theory, design, construction practice and applications, this comprehensive bibliography supplies 190 annotated references to the literature from all over the world for the past sixty years. The patent literature has not been covered, except for the inclusion of a few of the earliest patents. Each entry gives source, date, number of pages, price where possible, and a brief, concise annotation.

BRITISH STANDARDS INSTITUTION. STANDARDS.

British Standards Institution, London.

Moulded Insulating Materials for General Electric Purposes. BS 488: 1948. *2/6.*

This standard covers moulded materials for use as insulating materials for general electric purposes on currents up to 250 volts, and at working temperatures not exceeding 100° C. It provides for four grades of moulded materials based on resistance to heat and specifying qualifying limits for electrical properties, resistance to heat, strength, and general properties for each grade.

Treatment of Water for Marine Boilers (with a Section on Engineering Factors). BS 1170:1947. *10/6.*

This is a revision of the wartime standard. It describes that method of boiler water treatment by which the scale and corrosion-forming salts are destroyed by alkaline reagents, with or without the use of an organic coagulant, as may be considered necessary. Three methods of water treatment are prescribed. Abbreviated instructions for these three methods are given in the form of data sheets in an appendix.

LIMITS AND FITS FOR USE IN LOCOMOTIVE WORK, January, 1948:

Locomotive Manufacturers Association of Great Britain, London, 1948. 15 p., 7¾ x 5 in., leather.

This is one of the standards to be used in locomotive manufacture, since all locomotives built in Great Britain for export will henceforth be constructed to standard tolerances to provide interchangeability and standardization to such a degree as to simplify considerably running-shed maintenance replacements, shop overhauls, and the ordering and assembly of spare parts.

MEASUREMENT OF FLUID PRESSURE; PRESSURE GAUGE EQUIPMENT, ITS APPLICATION, INSTALLATION AND MAINTENANCE:

J. R. Fawcett. Manchester, Emmott, 1948. 42 p., illus., 7¼ x 5 in., paper, 2/-. (Mechanical World Monographs No. 42.)

This Monograph describes the construction and use of instruments for measuring pressure, from the lowest vacua to the highest pressures found in practice. Many of the commoner problems met with in pressure measurement are considered and some description is given of the points to be watched when dealing with various fluids and the different methods of producing pressure.

SPEED CONTROL OF ELECTRIC MOTORS:

Emmott, Manchester, 1948. 51 p., illus., 7¼ x 5 in., paper, 2/6-. (Mechanical World Monographs No. 45.)

This Monograph reviews the subject of variable speed operation of electric motors in general, dealing with characteristics of various types of motors, their possibilities and limitations from a speed control point of view.

U.S. HIGHWAY RESEARCH BOARD. BULLETINS:

Washington, Highway Research Board, 1948.

No. 12—Highway Finance.

Included in this bulletin are papers on the Federal-aid highway program; highway finance and the consumer; information needed for fiscal and allied phases of long-range highway program planning; highway revenue and expenditure trends; and current long-range studies of highway modernization programs.

No. 14—Soils Committee Reports and Special Papers.

This bulletin contains reports of the committee on frost heave and frost action in soils, the committee on soil cement roads, and the committee on soil calcium chloride roads. The special papers are as follows: Field studies to determine the value of calcium chloride for compaction of soils; and jacked-in-place pipe drainage.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

COBALT. (A.C.S. Monograph No. 108).

R. S. Young. Reinhold Publishing Corp., New York, 1948. 181 p., illus., charts, maps, tables, 9¼ x 6 in., cloth, $5.00.

Written for the scientific worker who wants either complete or specific information, this monograph assembles and reviews critically existing data on the chemistry and metallurgy of cobalt. Certain unpublished features and developments which have come within the author's experience are included. Promising lines of further investigation in various fields are indicated.

COMBUSTION ENGINEERING, a Reference Book on Fuel Burning and Steam Generation.

Edited by O. de Lorenzi. Combustion Engineering Co., New York, Montreal, 1947. Paged in sections, illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50.

This book deals with the various methods and equipment used for fuel burning, steam generation, and heat recovery, and was prepared by a number of fuel technologists, combustion engineers, and specialists. Brief outlines of early developments, as contrasted with modern designs, are included in many chapters. Selection of equipment and performance calculations are considered as well as the operation and maintenance of equipment. Numerous tables and diagrams complement the text.

COMPANY WAGE POLICIES.

R. A. Lester. Princeton University, Princeton, New Jersey, 1948. 45 p., 9¼ x 6 in., paper, $1.50. (Industrial Relations Section Research Report Series: No. 77.)

This brief study is the result of a survey of the processes by which wage policy is determined by some 100 representative manufacturing companies in the United States, small and large. Topics dealt with include the basis for plant level of rates, factors in wage-level charges, and the consequences of intercompany uniformity.

CYBERNETICS, OR CONTROL AND COMMUNICATION IN THE ANIMAL AND THE MACHINE.

N. Wiener. John Wiley & Sons, New York; Herman et Cie, Paris, 1948. 194 p., diagrs., charts, 9¼ x 6 in., cloth, $3.00.

This book describes the application of statistical mechanics methods to communications engineering. Its subject matter ranges from such control mechanisms as servomechanisms, mathematical calculators, and automatic pilots, to the nerves and brain of the human body. Representing the meeting point of control and communications engineering, neurophysiology, and psychology, the discussion considers human control functions and the mechanico-electrical systems designed to replace them.

LITERATURE SEARCH ON DRY CELL TECHNOLOGY. (Special Report No. 27.)

M. Dolan and B. H. Weil. Georgia Institute of Technology, State Engineering Experiment Station, Atlanta, Ga., 1948. 700 p., 8¾ x 5½ in., leather, $5.00; foreign, $5.50.

This compilation, placing special emphasis on synthetic manganese dioxide depolarizers, was prepared in connection with a research program at the State Engineering Experiment Station of the Georgia Institute of Technology. It constitutes an indexed, annotated bibliography of the pertinent literature dealing with (1) dry cell technology, (2) manganese ore deposits throughout the world, and (3) methods of treating such ores for the preparation of depolarizing compounds. Over 1500 abstracts from journals and more than 2300 digests of pertinent foreign and domestic patents are given.

NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS, Proceedings, 3rd Annual Meeting, October 16-17, 1947.

Armour Research Foundation, Technology Center, Chicago 16, Illinois, 1948. 129 p., illus., diagrs., charts, tables, 9 x 6 in., paper, $3.00.

The Conference attempts to fulfill a need for an interchange of ideas on problems confronted in the large field of industrial hydraulics. The papers from the third meeting deal with hydraulic governor operation, hydraulic circuits of industrial process controls, various phases of cavitation, practical hydraulic coupling design modifications, hydraulic transmissions, and the design of hydraulic seals.

NON-FERROUS METALS AND ALLOYS.

E. Gregory and E. N. Simons. Paul Elek, 38 Hatton Garden, London, E.C.1, 1948. 196 p., illus., charts, tables, 7½ x 5 in., cloth, 12s. 6d.

Of value to students and engineers, this simply written book is an exposition of the character, properties and treatment of the important non-ferrous metals and alloys. The opening chapter deals with the general principles of heat treatment. Each group of alloys is then considered in turn, concluding with solders, bearing alloys, and the precious metals.

RADIO AT ULTRA-HIGH FREQUENCIES, Volume II (1940-1947).

Edited by A. N. Goldsmith and others. Published by RCA Review, Radio Corporation of America, R.C.A. Laboratories Division, Princeton, N.J., July 1948. 485 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $2.50 plus $0.20 postage to foreign countries.

This compilation of original and reprinted papers is presented in seven sections: antennas and transmission lines, propagation, reception, radio relays, microwaves, measurements and components, and navigational aids. As additional sources of reference, the appendices include a bibliography and summaries of all papers appearing in volume I of the set.

RUBBER TO METAL BONDING.

S. Buchan. Crosby Lockwood & Son, Ltd., London; Technical Book Association of Canada, Vancouver, 1948. 239 p., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 21s.

This work on the use of rubber as a constructional unit deals particularly with the process which utilizes brass plating as a bonding agent, although other bonding agents are discussed. Both natural and synthetic rubbers are considered, molding methods are described, and the mechanism of the rubber-to-brass bond is gone into in detail. The bibliography consists of data sources referred to in the text.

SIMPLIFIED DESIGN OF STRUCTURAL TIMBER.

H. Parker. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 218 p., diagrs., charts, tables, 8 x 5 in., leather, $3.25.

Of value to builders and architects, this book can also be used by those with no previous training or study. Dealing primarily with wood members that support loads in buildings, the book includes a full explanation of the principles of mechanics involved in the design of these members which is based on the recommendations of leading authorities of timber construction. There are 45 useful tables as well as practical examples and problems.

SPECIFICATIONS AND LAW ON ENGINEERING WORKS.

W. C. Sadler. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 493 p., tables, 8½ x 5½ in., cloth, $5.00.

Designed for the engineer with little or no legal training, this book provides a foundation in engineering law for the writing of specifications. A summary of the historical significance of various legal systems is included. Among the topics specifically discussed with examples taken from actual experience are the legal instruments of contractual documents, illegal matters of concern to engineers, the law on agency partnerships and corporations, patents, and workmen's compensation. A complete set of detailed contracts and specifications, covering the construction of a transmitter building for the University of Michigan, is presented in the appendix.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

COLLEGE PHYSICS.

H. A. Perkins. 3 ed. Prentice-Hall, Inc., New York, 1948. 786 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.65; text ed., $5.00.

The purpose of this book is to give the student a substantial grasp of physical principles rather than to describe phenomena. Covering all the usual phases of physics included in an elementary text, this volume uses very simple algebra and trigonometry. Some historical background is given, and modern ideas are used throughout. Mention is made of such new developments as radar, and there is a considerable discussion of atomic energy. Problems with and without answers follow each chapter, and a section of the appendix deals with the solution of problems.

ENGINEER'S SKETCH-BOOK OF MECHANICAL MOVEMENTS, DEVICES, APPLIANCES, CONTRIVANCES AND DETAILS.

T. W. Barber. 7th ed. E. & F. N. Spon, Ltd., 57 Haymarket, London, S.W.1, 1948. 355 p., diagrs., tables, 8½ x 5¼ in., cloth, 15s.

This book provides, side by side, brief descriptions and sketches of the various devices in use for accomplishing many specific mechanical movements or works. Such devices as accumulators, bearings, cams, doors, gears, handles, jets, levers, pivots, rotary engines, swivels and tappets are included. In this fifth edition, the text and many of the sketches were revised, and many additions have been made.

EXPLORING ELECTRICITY, Man's Unfinished Quest.

H. H. Skilling. Ronald Press Company, New York, 1948. 277 p., illus., diagrs., 8½ x 5½ in., cloth, $3.50.

Considering electricity through the years as the scientists knew it, this volume is devoted to stories of these scientists and their friends, including the outstanding personalities from Thales to Fermi. A knowledge of electrical principles is developed through the historical approach.

GENIUS OF INDUSTRIAL RESEARCH.

D. H. Killeffer. Reinhold Publishing Corporation, New York, 1948. 263 p., charts, 9¼ x 6 in., cloth, $4.50.

This treatment of modern industrial research and its methods is intended primarily to guide the ambitious young researcher to a better understanding and a surer mastery of his craft. The material is mostly from the field of industrial chemistry. The accounts of how many important modern developments were achieved are quoted directly from the original presentations.

HIGH-SPEED AERODYNAMICS.

H. W. Sibert. Prentice-Hall, Inc., New York, 1948. 289 p., diagrs., charts, tables, 8½ x 5½ in., cloth, $6.00.

Dealing with both the subsonic and supersonic ranges, this book analyzes the various aspects of the flow of a compressible fluid past a solid body. The effects of certain wing types and of high airplane Mach numbers on airplane performance are discussed. A knowledge of the calculus and elementary aerodynamics is the minimum prerequisite.

KINEMATICS MACHINES.

L. M. Sahag. Ronald Press Company New York, 1948. 249 p., illus., diagrs., 9½ x 6 in., cloth, $4.00.

Following introductory chapters on fundamental conceptions and motion in machines, the text is divided into separate detailed discussions of the particular actions and mechanisms dealt with, such as: instant centers, linear and angular velocities, cams, gears, flexible links, etc. In the solution of problems in velocities and accelerations the graphic method has been applied in preference to the analytic method.

PETROLEUM PRODUCTION, Vol. IV, Condensate Production and Cycling.

P. J. Jones. Reinhold Publishing Corp., New York, 1948. 238 p., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

Continuing the author's "Petroleum Production" series, the present volume discusses the production of the liquid commercially extractable from the gases found in reservoirs at pressures greater than the minimum condensation pressure for heavy ends. A thorough mathematical analysis is made of the varied situations in which it is economically worthwhile to carry on this production by cycling or other means of pressure maintenance. Section II on applications deals with specific cases of radial, elongated, and linear reservoirs, and discusses the maximum efficient rate of production.

PRECISION MEASUREMENT METHODS AND FORMULAS.

J. Johnson. Pitman Publishing Corp., New York and London, 1948. 181 p., diagrs., tables, 9½ x 6 in., linen, $3.00; 16s.

Bridging the gap between "school" mathematics and practical application of theory, this book on tool inspection presents actual problems and their solutions. The overall theory behind the solution is clearly shown. Solutions are for the greater part based on setups requiring the simplest of instruments. No special ability other than knowing how to use trigonometric tables is necessary.

UNDERWATER EXPLOSIONS.

R. H. Cole. Princeton University Press, Princeton, N.J., 1948. 437 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50.

Emphasis is placed on fundamental physical properties and useful theoretical methods of shock wave development and propagation. Following a qualitative description of an underwater explosion, there is a general discussion of basic hydrodynamical relations. The detonation process and theory of shock waves are considered next. Various pressure gauges, photography of underwater explosions, shock wave measurements, motion of a gas sphere, and secondary pressure waves are also considered.

VANDERBILT RUBBER HANDBOOK.

Edited by S. S. Rogers, published by R. T. Vanderbilt Co., 230 Park Ave., New York. 9th ed., 1948. 719 p., illus., diagrs., charts, tables, 8½ x 5½ in., fabrikoid, $7.50.

The purpose of this reference manual is to instruct new men entering the rubber industry in the fundamentals of compounding, and to provide experienced technologists with needed information and data. To accomplish these aims, the discussion deals first with basic substances, properties and processes; next with fundamental compounding procedures; and finally with the application of the foregoing principles to the compounding of specific types of rubber goods.

WELDING FUNDAMENTALS.

H. P. Rigsby. Pitman Publishing Corp., New York and London, 1948. 178 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $2.75.

In this compilation of the fundamentals and principles of welding for the engineering student the actual technique of welding is treated as secondary material. Following a historical development of the various welding methods are chapters on the equipment needed for each method. Welding gases, rods, fluxes, and types of joints are considered as well as the testing of welds. Standard welding symbols and a glossary of welding terms are included.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

This year the B. J. Coghlin Company Limited of Montreal is celebrating its 80th anniversary as a manufacturer of springs, track tools, and railway supplies.

The Company was formed by Bernard James Coghlin in 1869. Mr. Coghlin, who was trained in one of the steel works in Sheffield, England, came to Canada to take over a small spring plant operating under the name of the Montreal Spring Company. The Company was incorporated under a Dominion Charter in 1910 when Bernard W. Coghlin was elected president and managing director, which position he still holds.

•

The New Holland Manufacturing Company of Mountville, Pa., commenced quantity production in January of what is claimed to be world's largest impact stone crusher. This new crusher known as Model 5050 Double Impeller Breaker has been under test for many months. The manufacturers claim that it can take stone up to 50 inches and reduce it to aggregate in one operation. For complete details communicate with the manufacturer.

•

The British Columbia Coast Lumbermen have sponsored a new Trade Bureau to be known as the " B.C. Coast Woods Trade Extension Bureau ". H. J. Mackin has been elected president and R. M. Shaw the vice-president.

The new bureau, which is sponsored by the B.C. Lumber Manufacturers Association, Western Lumber Manufacturers Association, and Alaska Pine Sales Ltd., has been formed to promote the use and marketing of lumber and allied products through advertising, trade extension, and research. The trade extension campaign for the initial part of the current year is chiefly concerned with promoting the use of correct grades of wood in home construction.

The Bureau has prepared two pamphlets which are available on request. " Use the Right Grades of Lumber in Your Home ", which is intended primarily for architects, engineers, and contractors and " A Quality Home Can Cost Less " which is directed at lumber dealers. These publications may be obtained from the Bureau. All communications should be addressed to: The Secretary, B.C. Coast Woods Trade Extension Bureau, 837 West Hastings St., Vancouver, B.C.

Research and development of safety equipment for all industries, including the construction industry, will be undertaken in a new laboratory, to be built in Pittsburgh by Mine Safety Appliances Company.

•

A new design of heavy duty hose has been announced by the Dominion Rubber Co. Ltd., Mtl. Designated Poled Lead Press Hose, it combines the desirable features of both molded lead press and pole made hose.

The new hose is designed for heavy duty service in mining, construction and general contracting. The hose was first produced in 1939-40 and trial lengths were tested in a number of Canadian mines. Service life was exceptional under the extremely rugged conditions obtaining in the mining field. Owing to the war full production of this new type hose was delayed.

The manufacturer claims that the new hose is up to 30% lighter than conventional hose designed for equivalent service. It is also claimed that it has superior wearing qualities, other favourable features are smooth cover, close outside diameter tolerances, homogeneous bonding of cover, carcass and tube, close inside diameter tolerances, smooth, dense tube structure. It is available in 50 ft. lengths and is now being made in air drill and water types. Other types are being added.

•

Canada's largest transformer was placed in service by B.C. Electric Railway Company in January when a unit rated at 66,667 kva. came into operation at the Horne Payne sub-station at Burnaby, B.C. — six miles from Vancouver. First of the step-down units to supply power for Vancouver from B.C.E.R.'s Bridge River development at Shalalth, the transformer completes the first stage of the development—the first step-up unit (50,000 kva.) having gone into operation at Bridge River on October 23rd. Transmission voltage is 230,000 volts. The transformer was engineered and built at the Davenport (Toronto) Works of Canadian General Electric.

•

Addressing the Gauge and Toolmakers Association in London on February 15th, Sir E. H. Gilpin, chairman of the British Food Machinery Manufacturers Association, strongly urged United Kingdom industry to fight for the Canadian market. He said, " We industrialists must accept and co-operate with the Government policy of Canadian priority even to the extent of sacrificing some of the contents of our depleted pockets." Sir Harry stressed the importance of using Canadian publications as advertising media and the necessity for brochures and pamphlets prepared primarily for the Canadian market.

•

A new engineering material described as ductile cast iron which combines the process advantages of gray cast iron, such as fluidity, castability and machinability has been developed in the research laboratories of the development and research division of the International Nickel Company. Closing the gap between cast iron and cast steel, this material is characterized by a graphite structure in the form of spheroids, free from graphite in the flake form. It is claimed to have excellent physical properties, particularly high elastic modulus, high yield strength and ductility. Complete information on this new product may be obtained from the International Nickel Company of Canada Limited, 25 King Street West, Toronto 1.

•

Canadian General Electric Company Limited have opened a new plant at Cobourg, Ontario. This will be used for the manufacture of compression, injection, molded, and extruded plastics for a wide variety of industrial and domestic uses such as radio cabinets, telephones, tubing, spinning buckets for textile mills, electrical insulating parts, cosmetic containers, and household applications.

The plant is equipped with 70 hydraulic compression molding presses including a 924-ton 28-inch ram, which is claimed to be the largest in Canada. The plant occupies 76,000 square feet and production area is all on one floor. Up to 350 persons will be employed. Many interesting features were incorporated into the plans for this building and the Company will be pleased to supply additional data.

•

Weathertight steel shipping containers have been developed by the Dravo Corporation of Pittsburgh for use as portable field offices and as tool cribs on construction projects. The address of the Company is Dravo Corporation, Neville Island, Pittsburgh 25, Pa.


HALLMARKS
The T. Eaton Company Maritimes Limited
Northern Electric Company Limited
Dominion Textile Company Limited
Mack Trucks of Canada Limited
Shawinigan Water & Power Company
ROBB VICTOR BOILER
MANUFACTURED BY
DOMINION BRIDGE COMPANY LIMITED
BOILER NO.
SIZE
T.P.
MAX.W.P.
DATE
"Vaseline" Brand Products
Royal Typewriter Company Limited
National Breweries Limited
Canadian Broadcasting Corporation
The Bell Telephone Company of Canada
Canadian National Railways
Singer Sewing Machine Company Limited
McColl-Frontenac Oil Company Limited
Fairchild Aircraft Limited
Trans-Canada Airlines
International Harvester Company of Canada Limited
Canada Dry Ginger Ale Limited
Aluminum Company of Canada Limited
17th Duke of York's Royal Canadian Hussars, Armoury
LIKE a stamp of approval—the names on this page denote quality in their respective fields.
It is to be expected that such organizations should install equipment which is itself reliable and of high quality. That is why you will see the name "ROBB-VICTOR" in their boiler rooms—a name which is also a hallmark and an assurance of efficient and dependable service at all times.
BOILER DIVISION DOMINION BRIDGE COMPANY LIMITED
Plants at: Calgary, Winnipeg, Toronto, Ottawa, Montreal.
Assoc. Companies at: Edmonton, Sault Ste. Marie, Quebec.
In the Maritimes: Robb Engineering Works Ltd., Amherst, N.S.
Other Divisions: Structural, Mechanical, Platework, Warehouse

Russel-Hipwell Engines Limited of Owen Sound, Ontario, have developed a new powerful Diesel unit providing "low weight per horsepower" power for a variety of applications. For details communicate with the manufacturer.

•

An architectural exhibition, of a kind never before seen, is to be held in London as a part of the Festival of Britain in 1951. It will be sited in the centre of London, on the banks of the Thames, in the vicinity of Westminster Bridge. It will take the form of a cross-section of a typical residential neighbourhood. This will be shown as in the course of construction and will comprise not only houses and flats but other features which go to make up a properly balanced development. Some of the dwellings to be exhibited will be completed while others will be only partially finished to indicate the various types of building technique.

•

During 1948 Great Britain was the largest exporter of automobiles. Her overseas sales of cars, commercial vehicles and agricultural tractors totalled $584,000,000 or $240,000,000 more than in 1947. The number of motor vehicles exported in December was the highest in the year.

•

Canadian Car & Foundry Company Limited has commenced its delivery of 55 Canadian Car-Brill C-36 Inter-urban buses to Provincial Transport Co. These buses are of very modern design with special suburban type seats, foam rubber cushions and arm rests, interior parcel racks, individual reading lights for each pair of seats. They are powered by Hall-Scott underfloor engines.

•

A new large volume Whiteprinter has been announced by the Charles Bruning Co. Inc., Chicago, Illinois. The machine is intended primarily for use in engineering and business offices where there is a large volume of duplicating work. The manufacturer claims it will reproduce anything drawn, typed, written, or printed upon translucent mediums, at speeds up to 105 square feet per minute. Prints from post card size up to 42" in width and in any length are made on the machine with equal ease. This new Bruning Whiteprinter is known as the "Volumatic Model 93." The manufacturer will supply descriptive material.

•

Dutch Industries will be represented at the Trade Fair in Toronto May 30th to June 10th.

•

Northern Electric Company Limited have now incorporated into their medical programme a series of vision tests. The principal equipment to be used during these tests will be an "Ortho-Rater", manufactured by the Bausch & Lomb Optical Company. The purpose of the tests is to make sure that employees' vision is adequate for the jobs in which they are engaged and advice will be given on how defective vision may be improved.

•

A fourteen day aircraft show will be held at the Canadian National Exhibition, Toronto, from August 26th to September 10th. The aircraft show is to take place in the Exhibition Grounds and on the mezzanine of the spacious Automotive Building, where 30,000 square feet of space is being made available. The show will feature products of some of the leading Canadian, U.S. and British aircraft manufacturers.

•

Petrochemicals Ltd., with head office in London, England, have announced the installation and operation of the first cracking furnace in their plant at Partington near Manchester. The "Catarole Process" is employed. According to information received from the Company, from the beginning of operation the quality of the products, both liquids and gases, has been up to specification and the yield of olefinic gases, which constitute a valuable part of the gaseous product, is higher than expected. Delivery of gases to the Manchester Corporation Gas Works has commenced.

The Catarole process converts an essentially non-aromatic charging stock derived from petroleum into the full range of aromatic hydrocarbons, formerly obtainable only from coal tar. The process is new and is an entirely British invention.

•

The American Standards Association has just given its final opproval to a new American Standard which puts into effect the Unified Screw Thread system agreed upon by Great Britain, Canada, and the United States by the Declaration of Accord signed in Washington last November.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

South Bend Lathe Works, South Bend 22, Indiana, offers readers of the Journal a large size Works Wall Chart, entitled "Tap Drill Sizes".

•

Leeds and Northrup Co., 4911 Stenton Ave., Philadelphia 44, Pa., have prepared a most interesting catalogue covering their complete line of Speedomax indicators, recorders and controllers.

The publication contains 44 pages. It is well illustrated, and presentation is excellent. Copies may be obtained on request.

•

A 36-page booklet, just released by Hardinge Co., Inc., 240 Arch Street, York, Pa., contains a general discussion of dry grinding, five pages of operational tips for improving mill performance, a number of typical dry-grinding layout drawings, and operational data from several dozen specific installations in the mining, metallurgical, chemical, ceramics, stone, iron and steel industries. Ask for bulletin 17-B.

•

Watson Jack & Company Limited, 1410 Stanley Street, Montreal, have just published a 32-page booklet, 8½ in. x 11 in., entitled, "WAJAX Forest Fire-Fighting Equipment". Copies are available.

•

Nordberg Manufacturing Co., Milwaukee 7, Wis., announces publication of bulletin 163, on Nordberg Diesel Engines, type DB-24, for stationary and marine service for Duafuel or oil burning operation, supercharged and non-supercharged.

The brochure consists of eight pages printed in two colours and it describes and illustrates a vertical, four-cycle, single acting, trunk piston type engine of 16½ in. bore and 24½ in. stroke. Ratings range from 815 to 1900 horsepower at speeds of 277 and 300 r.p.m. Sizes range from five to eight cylinders. Ask for bulletin 163.

•

Patent restrictions on the sale of preformed wire rope in Canada expired on February 10th. R. G. LeTourneau are now offering their product "Tournarope" to earthmoving and materials handling contractors throughout the Dominion. The Wire Rope Division of the Company will market this product through authorized Canadian LeTourneau Distributors. Folders and bulletins describing Tournarope may be obtained from R. G. LeTourneau, Inc., Peoria, Illinois.

•

A very attractive 8-page folder has been prepared by Surface Combustion Corporation, Toledo, Ohio, to describe its line of Standard-Rated Industrial Furnaces. The booklet is printed in two colours and is profusely illustrated. The equipment covered in the folder includes that required for hardening, tempering, forging, metal melting, air heating etc. Ask for Bulletin SC-141.

•

Canadian Ingersoll-Rand Co. Ltd., New Birks Building, Phillips Square, Montreal, have issued three publications. Two of these "How to Make Your Air Power Equipment Do More Work at Less Cost," and "The Little Book With Big Money Saving Ideas" are of pocket size. The third publication "The Rotary Electric Impactool" measures 8½ by 11 in. Copies of these publications may be obtained from the Company.

•

A 12-page illustrated bulletin on "Flamenol Insulated Wire and Cable" has recently been issued by Canadian General Electric Co. Ask for CGEA-2733E. Apply to any C.G.E. office.

•

Aveling-Barford Ltd. of Grantham, England, who now have representation in Canada from coast to coast have published a series of most interesting booklets and brochures. These are "What We Make". It covers their complete line of Road Rollers, Dumpers, and the Calfdozer trench cutting machine and vibratory concrete finishers. Separate publications are also available covering the Company's One Yard Dumper, The Dumptruck, 12 Ton Dumper, Trench Cutting Machine, Diesel Shuttle Dumper, Vibratory Concrete Finishers, and Road Rollers. Copies of these publications may be obtained on application to Charles Cusson Ltd., 284 Ontario St. W., Montreal; M. L. Baxter Ltd., 1900 St. Clair Ave. W., Toronto; Vancouver Engineering Works Ltd., 519 W. 6th Ave., Vancouver; Vulcan Iron & Engineering Works, Winnipeg, Man.; Industrial Road & Equipment Ltd., Calgary and Edmonton, Alberta.

•

South Bend Lathe Works, South Bend 22, Indiana, offers catalogue No. 77-U covering machine tool attachments and accessories. The catalogue has 28 pages and contains illustrations and specifications on items which will make possible the performance of a wider range of work on lathes and drill presses.

•

The February 1949 issue of the Bepco Journal contains an interesting article on Oil Circuit Breakers by Brian M. Burt. To have your name placed on the mailing list for this interesting publication write to Bepco Canada Ltd., 4018 St. Catherine St. West, Montreal 6, Que.

•

The Gerin Corporation of Red Bank, N.J., P.O. Drawer 653, is distributing a new circular No. 300 "Required Equipment for Lubrication Control". It illustrates the Portable Oil Inspection Kit recently announced by the Company whereby any mechanic can quickly measure the contaminants occurring in lubricating oil during use. There is no charge for the publication.

•

The Sulzer Technical Review No. 4, 1948, contains an article on air conditioning in the textile industry, a paper on the demand which the gas turbine designer must make on highly heat-resisting steels; and the practical means available for determining strength properties after long working periods. This issue also contains short notes on a number of reports on Diesel engines for French ships, the transport of a large marine engine on a Rhine barge and the recommissioning of the motor vessel "Aorangi". Copies of the publication may be obtained from C. O. Monat & Co. Ltd., 6520 Park Avenue, Montreal, Que.

•

The eighteenth volume of the C.I.L. "Oval" began with the February issue, copies of which are now available. The "Oval" is published every two months in separate English and French editions by the Public Relations Bureau of Canadian Industries Ltd. It is a semi-technical publication and is of wide-spread interest. For copies apply to the Editor, the C.I.L. Oval Box 10, Montreal, Que.

•

The February 1949 issue of the "Dominion Engineer" is devoted to the publication of an article "How to Sell Quality" by J. C. Aspley. The article is based on the creative selling methods of the top salesmen in forty-three nationally known companies. For copies of the publication apply to the Dominion Engineering Co. Ltd., P.O. Box 220, Montreal, Que.

•

Performance of wrought iron in more than 100 different applications in the marine industry, including ships, structures and shore installations is described in a new 64 page book just published by A. M. Byers Co., Pittsburgh.

Illustrated descriptions of the service record of wrought iron plate for the hulls of all types of vessels, some of them a century old, are contained in one chapter of the book. Use of wrought iron plate and pipe for many other services aboard ships are also depicted.

The publication shows also how piers are being equipped with fire steps of wrought iron plate to retard the spread of flames, at the same time resisting the corrosive action of salt water. This interesting book describes, also, dam design and construction, and numerous applications for wrought iron such as by-pass and air inlet piping for penstocks, drainage lines, stop-log guides, bars for locking pre-cast concrete riprap in place, and skin plating. Members of the Institute may obtain a copy of the publication without charge.

•

The Aluminum Co. of Canada Ltd., Sun Life Bldg., Montreal, Que., publish regularly the "Alcan Ingot" and "Aluminum News". To ensure regular receipt of these publications please communicate with the Company asking that your name be placed on the mailing list.

•

Spielman Agencies Ltd., 420 Lagauchetiere St. West, offer the revised issue of the Kerner-Greenwood Waterproofing Specifications Booklet. This booklet covers those types of Portland cement concrete, stucco and plaster waterproofing work that occur in everyday practice. The booklet contains 20 pages and there are twenty diagrams. A copy will be forwarded on receipt of request.

•

To those who are interested in machine tools, "Landis Thread Tips" is recommended. This publication is published monthly by the Landis Machine Co., Waynesboro, Penna.

"Business & Industrial Briefs"

This section of the *Journal* is intended to keep readers informed on developments and changes in those business and industrial enterprises, and on new products, which affect the engineer.

If you write with respect to any of the items in this, or other sections, please mention

THE ENGINEERING JOURNAL

Appointments and Transfers

Canadian Westinghouse Co. Ltd. announces the retirement of George F. Foot who held the position of manager of sales. Mr. Foot entered the electrical industry in 1900 with the Westinghouse Electric and Manufacturing Co. at Pittsburgh. After service in the Tracing Dept., he entered the engineering department where he was assigned the responsibilities of correspondence with engine and water-wheel builders for the mounting of generators with their prime movers. During this period Mr. Foot organized night classes in mechanical drawing under Dr. Charles F. Scott, then chief electrical engineer of the Company. These classes were the origin of the Westinghouse Employees Educational System. He came to Canadian Westinghouse in 1905 and has travelled extensively throughout the Dominion on behalf of his employer. He was appointed assistant manager of sales in 1929.

Born in Stratford, Ont., Mr. Foot was educated in London, Ont., and later studied engineering under Westinghouse engineering experts in Pittsburgh.

G. E. Bourne

G. E. Bourne has been given general responsibility for the nucleonics activities of Canadian General Electric's Apparatus Department.

Mr. Bourne joined the Test Department of C.G.E. in 1920 and has had long experience in the field of electrical apparatus. In his present capacity he will maintain liaison with the programmes of research and development in Canada and the United States and, in particular, will study the programme being conducted by the General Electric Company for the U.S. Atomic Energy Commission.

William Barnacal has been appointed assistant works manager of the Canadian General Electric's plant in Montreal. Until his present appointment, Mr. Barnacal was general superintendent of the Company's plant in Peterborough. He has had very broad experience over the last half century in mechanical and production engineering. He served his apprenticeship with an engineering and ship-building firm in Great Britain and graduated from Liverpool University in mechanical engineering. During the war, he was responsible in the Department of Munitions and Supply for much of the building and equipping programme of Sorel Industries Ltd. and other munition plants.

•

J. W. Cote has been appointed general sales manager of the Laurentide Equipment Co. Ltd., Montreal.

•

T. J. Carey has been appointed manager of the plastics and porcelain section in the Chemical Division of Canadian General Electric. In his appointment Mr. Carey will be responsible for the commercial policy and administration of the wide range of industrial molded plastics produced in the Company's new Cobourg Works. His activities will also include electrical porcelain products of the Peterborough works.

•

Alex M. Thomson has been appointed managing director of Dresser Manufacturing Co. Ltd., Toronto. D. B. McWilliams, the former managing director, submitted his resignation to the Company effective January 1, 1949, so that he could devote his entire time to the operation of the McWilliams-Beardmore Mines Ltd. Mr. Thomson has been employed for the past 2½ years as sales engineer for the Dresser Manufacturing Co. He will continue to give his personal attention to all field problems in sales and engineering.

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COVER PICTURE

High above the St. Lawrence River, on the slopes of Cape Diamond stands historic old Quebec City—dominated by the Chateau Frontenac.

In this baronial Norman castle, commencing May 11th, engineers from every province, from the United States, Brazil and several countries of Europe will gather for the 63rd Annual Meeting of the Institute and the first Western Hemisphere Regional Conference of the International Committee of Scientific Management. *Canadian Pacific Railway Photo*

The Arvida Bridge

Design of The Aluminum Superstructure

by

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Canada is soon to build at Arvida, Quebec, the first all-aluminum highway bridge on the American continent. This paper tells of the preliminary planning, gives a general description of the structure and outlines its design, including specifications, loads, stresses, etc. Problems peculiar to aluminum construction are discussed with indications of methods by which they were overcome. Measures for the protection of aluminum are outlined.

The paper will be presented in summary at the Annual Meeting in Quebec with additional details of fabrication and proposed erection procedures.

THE bridge will be situated in the municipality of Arvida and will span the Saguenay River in the immediate vicinity of Shipshaw Power House No. 2, a 1,000,000 h.p. hydro-electric plant supplying power to the Arvida aluminum works of the Aluminum Company of Canada, Limited. See Fig. 1. The present facilities for crossing the river consist of two bridges, railway and highway, both situated about a mile upstream from the power house. Formerly the existing highway bridge was quite adequate, but with completion of the Shipshaw plant and the extension of the Arvida city limits to include Shipshaw townsite, the need for a second crossing soon became evident.

In 1943, at the request of the City of Arvida, the General Engineering Department of the Aluminum Company of Canada began to make preliminary studies of the proposed bridge.

On account of the natural beauty of the site and the intention to develop the south shore opposite the Power House into a landscaped park area, considerable thought was given to the appearance of the structure. The arch type was chosen as the one most appropriate to the topography of the site, its use being fully justified technically by the excellent rock formations on the shores capable of taking the thrust.

With regard to the general conception of the project, valuable suggestions were received from Messrs. F. G. Todd, landscape architect, and H. L. Fetherstonhaugh, architect, both of whom had been consultants on the Shipshaw townsite work. Much-appreciated advice was also obtained from Mr. Olivier Desjardins, chief engineer, Department of Public Works, Province of Quebec. The late Mr. Paul Cret, consulting architect of Philadelphia, Pa., was consulted on the aesthetics of the bridge. In addition, he made some suggestions with regard to handrailing and the lighting scheme.

The locale being the heart of the aluminum industry in Canada, it was decided to study the feasibility of using structural aluminum instead of steel. An all-aluminum bridge, it was felt, would indeed be a fitting expression of the pioneering spirit and of the great development of that industry in the last decade or two. It was, of course, expected that the first cost of an aluminum bridge would be greater than that of a steel one, but that over the years, it would be more or less offset by lower maintenance charges.

The Aluminum Company of Canada prepared preliminary designs, in aluminum and in steel, and fixed the proposed location of the bridge and its alignment.

In April 1946, the City of Arvida invited the Dominion Bridge Company Limited to study the project further and to submit two alternative designs, based on the general arrangement as developed by the Aluminum Company. After many months of study and design, including frequent consultations with the Aluminum Company of Canada and Aluminium Laboratories Limited regarding the properties of aluminum alloys, Dominion Bridge Company submitted the two designs with approximate estimates of the cost of the metallic superstructure. The estimate for the aluminum alternative was perforce only an indication of the cost,

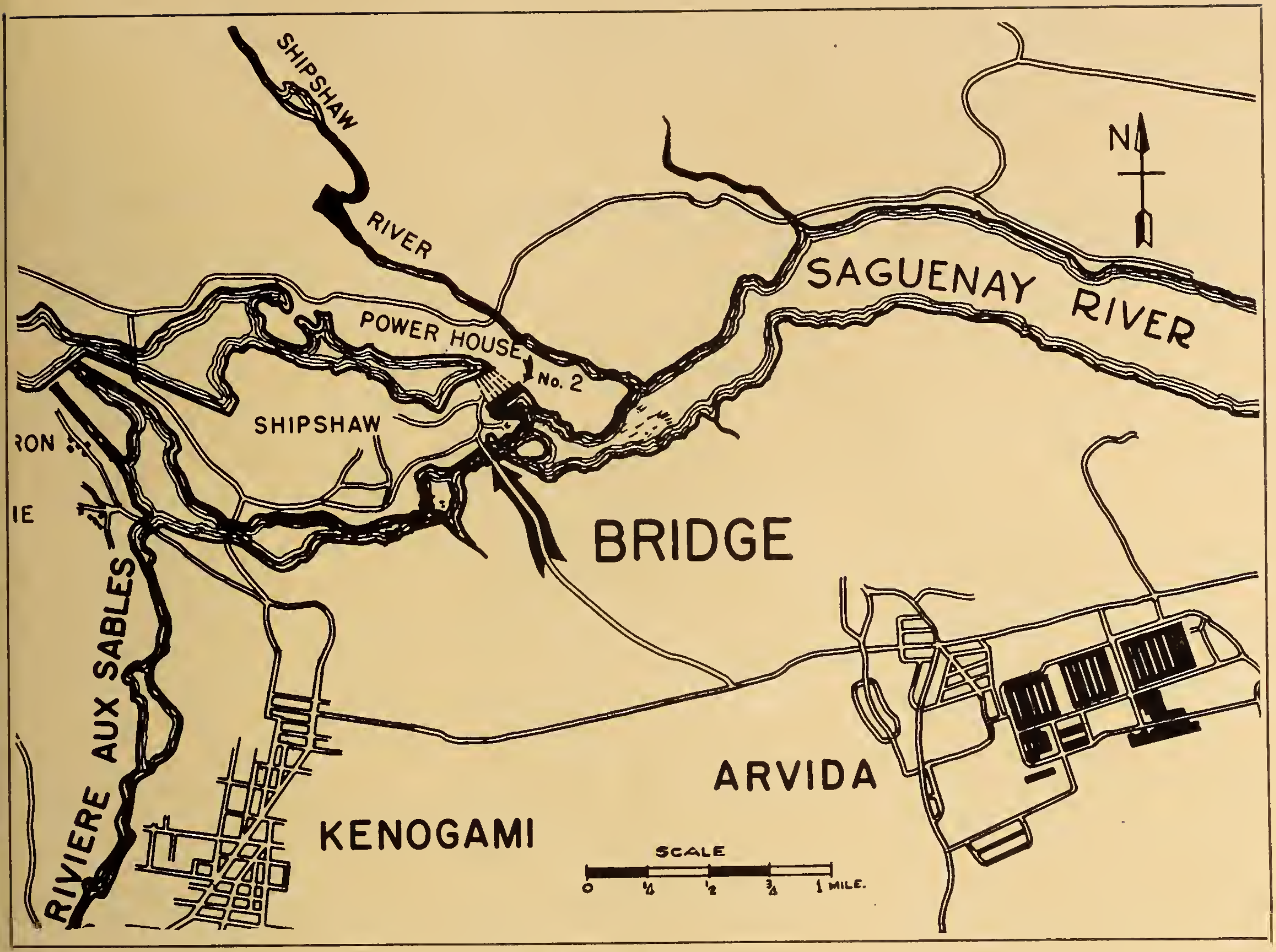


Fig. 1. Location map.

as it involved the fabrication of material with which the Company had had but limited previous experience and no experience at all in its application to bridgework. The City of Arvida adopted the aluminum design and instructed the Dominion Bridge Company to proceed with the job on the basis of cost plus a fixed fee. The firm of Surveyer, Nenniger and Chenevert, consulting engineers, was retained by the City to design and supervise the construction of the concrete deck slab, handrail, lighting arrangements and substructure.

To the best of the writer's knowledge, only two all-aluminum spans have been built to date; an experimental 100 ft. deck girder railway span in an otherwise steel girder crossing, built for the Massena Terminal Railroad, at Massena, N.Y., and a double leaf bascule bridge recently completed in England. Also, a number of existing bridge floors have been rebuilt in aluminum to reduce dead weight, as in the Smithfield Street suspension bridge in Pittsburgh, Pa.

General Description

The bridge consists of the main span which is a fixed arch 290 ft. centre to centre of skewbacks and 47½ ft. rise, and of five 20 ft. continuous girder approach spans at each end. (Figs. 2 and 3.) Total length between back walls of abutments is 504 ft. The box girder arch ribs are 23 ft. centres, and are braced with latticed girders, forming a K-system of bracing. All posts, over the arch as well as in the approaches, are on the same centres as the arch ribs and are spaced 20 ft. longitudinally. Of box construction, they are not braced in either direction, except for the posts at the skewbacks. The latter are braced together with horizontal struts, thus forming rigid frame bents, and are considerably heavier than the typical post, having been designed to take the lateral wind reaction from the deck.

The floor system consists of two lines of longitudinal girders, continuous from end to end and supported by the posts, and of floorbeams of the same depth as the girders and framing into them at panel points and at midspan. The floorbeams are thus spaced 10 ft., and carry a sidewalk bracket at each end. Longitudinal stringers on the centre line of the bridge span between floorbeams. Two lines of sidewalk stringers rest on sidewalk brackets.

The roadway is 24 ft. between curbs and is of 8-in. poured-in-place continuous concrete slab, reinforced in two directions. There is no crown in the roadway and the bituminous wearing surface is 2½ in. thick throughout. There are two 4 ft. sidewalks, of precast concrete construction. The units are 5 ft. long, the slab thickness varying from 6½ in. at the outer edge and 5½ in. near the curb. The curb was made only 6 in. high to allow the opening of car doors, but in the interest of safety, the aluminum handrailing, was designed for greater lateral forces than is usual. It consists of vertical square bars between two longitudinal 4 in.

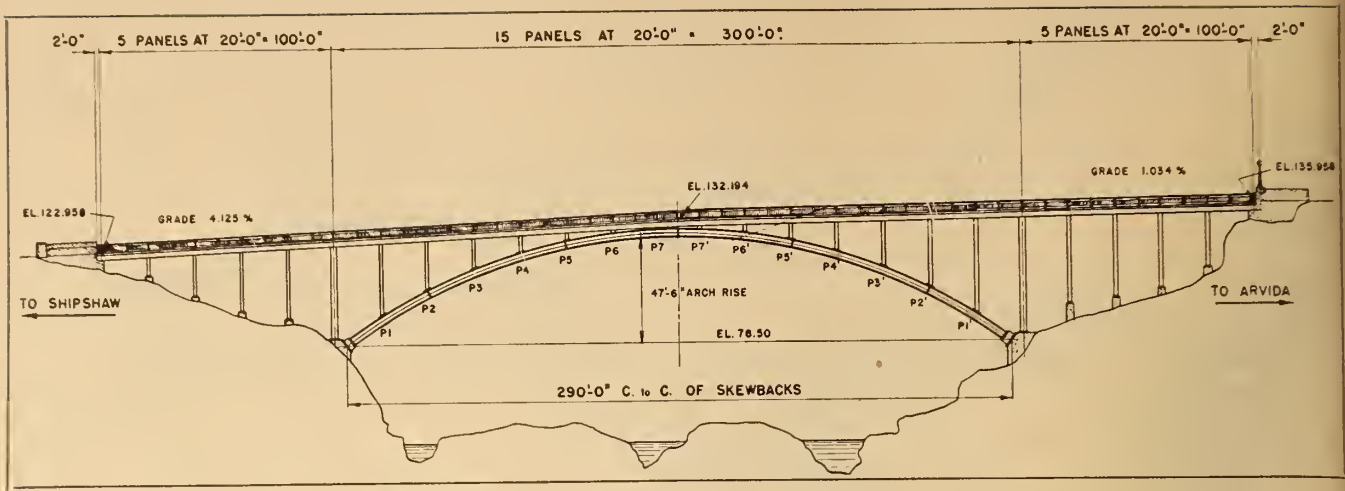


Fig. 2. Elevation of Aluminum Highway Bridge at Arvida.

channels, and of an extruded semi-elliptical section for the top rail, with posts at every floorbeam. A grooved, channel-shaped extruded fascia will conceal the edges of the sidewalks and will add to the clean cut appearance of the structure.

The bridge deck is sloping down from the south end, the grade being 1.034 per cent over the south approach, and 4.125 per cent over the north approach, with a joining vertical curve over the arch span. Finger-plate type expansion joints are provided in the roadway at both ends of the bridge, with drainage troughs underneath. There are no intermediate drainage scuppers. The bridge is lighted with fixtures located under the top handrail in pairs on either side of every fourth handrail post, on both sidewalks. Two ornamental pylons, made of fluted shafts supporting globes of the world in cast aluminum, are provided at the south end of the bridge, thus forming an entrance, as it were, to the bridge and the Power House beyond. Concealed lights in the pedestals of the pylons will illuminate the globes at night.

The sidewalks over the south abutment are widened to 8½ ft. to act as observation platforms.

Design

Specification—A special specification was drawn up, jointly, by the Aluminum Company of Canada, Aluminium Laboratories and Dominion Bridge Company, covering material, loads, unit stresses and allowable increases in them due to combined loads, painting and protection of metal, and other general considerations. In the proportioning of material and in the items not covered by this specification, the designers were guided by L. S. Moisseiff's "Design Specifications for Bridges and Structures of Aluminum Alloy 27 S-T", 1940 Edition.

Material—There is a great variety of aluminum alloys on the market, ranging from low strength commercially pure aluminum to high strength alloys for structural use. They are divided into two main groups, casting alloys and wrought alloys, the latter being subdivided into the "non-heat-treatable" and the "heat-treatable" alloys. The structural alloys used in this bridge are in the heat-treatable group.

The structural shapes are almost always formed by extrusion. In this process the ingot, 99.5 per cent Aluminum, is remelted, the alloying metals added, and the alloy is cast into ingots of suitable size. The ingot is placed in a press and is extruded under great pressure through an orifice having the shape of the desired section. The extruded piece is then subjected to a solution heat treatment, accomplished by heating it to the required temperature (about 500° C), in order to dissolve the soluble alloying constituents. This is followed by a rapid quenching in cold water to retain this state.

The metal being in a comparatively soft state and readily formed, the pieces are at this stage straightened by stretching. The metal begins to harden almost immediately after quenching, and in the naturally ageing alloys the maximum strength is reached in a few days. In other alloys, however, a second heat-treatment or artificial ageing is necessary. This consists of raising the temperature of the metal to about 170° C, holding it there for several hours, and then allowing it to cool at room temperature.

Plate and sheet undergo similar heat-treatment, but are rolled instead of extruded. To provide maximum resistance to corrosion, the alloy plate, prior to rolling, is placed between two sheets of pure aluminum and the three are rolled together, thus producing a plate consisting of an alloy core, coated on both sides with pure aluminum. Such plates are termed "Alclad".

All alloy designations in this paper are those of the Aluminum Company of Canada (Alcan). In collaboration with the metallurgists of the Aluminum Company, the following alloys were chosen for the various elements of the structure: *Alcan 26 S-T* for extruded shapes and Alclad plates, chosen chiefly for its high strength; *Alcan 16 S-T* for rivets, because of its adequate strength and good formability; *Alcan 65 S-T* for handrail, because of its excellent weathering qualities, and *Alcan 2S* for the thin sheets separating concrete deck from structural aluminum, to provide protection for the latter.

The chemical composition and pertinent mechanical properties of the above alloys appear in Appendix I, but the outstanding characteristics common to them all are: low Modulus of Elasticity (10,300,000 p.s.i., viz. about one-third that of steel); high coefficient of thermal expansion, about twice that of steel or average concrete; light weight, about one-third that of steel; susceptibility to galvanic corrosion and to chemical attack by alkaline solutions.

Loads

The bridge was designed for the following loads:

Dead Load—Actual dead load concentrations were calculated for each post, increasing slightly from the crown towards the skewbacks. The average dead loads are 4840 lb. per lin. ft. of bridge over the arch span and 4420 lb. per lin. ft. on the approaches.

Live Load—On Roadway: Two 20-ton trucks abreast or 80 lb. per sq. ft.

On Sidewalk: To stringers and brackets—Rear wheel of a 20-ton truck. To arch ribs—40 lb. per sq. ft.

The structure was also checked for an alternative live load of a 50-ton transformer on a 12-ton float, pulled by an 18-ton tractor. It was assumed that this load would travel on the centre line of the bridge at a slow speed, producing no impact.

Impact

30 per cent on all truck loads.

Wind

A lateral force of 30 lb. per sq. ft. on 1½ times the projected area of structure, plus 200 lb. per lin. ft. of bridge applied seven feet above roadway, or 50 lb. per sq. ft. on 1½ times the projected area of the unloaded structure.

Temperature—The structure was also designed to withstand stresses resulting from a temperature variation of 140° F, from −40° to +100°.

Lateral Loads on Handrailing—
To top rail: 700 lb. per lin. ft.

To complete panel between posts: 1140 lb. per lin. ft.

To posts: 4500 lb. at the top.

Unit Stresses—The normal allowable unit stresses in pounds per sq. inch for the various alloys are tabulated below:

Alcan 26S-T
Axial Tension, Net Section 21,000
Axial Compression, Gross Section
.40 (65,500-642 KL/r) for KL/r $\leqq$ 68
with maximum of 21,000

or $.40\left(\dfrac{102{,}000{,}000}{(KL/r)^2}\right)$ for KL/r > 68

Alcan 65S-T
Axial Tension, Net Section 15,000
Axial Compression, Gross Section
.40 (41,100-319 KL/r) for KL/r $\leqq$ 86
with maximum of 15,000

or $.40\left(\dfrac{102{,}000{,}000}{(KL/r)^2}\right)$ for KL/r > 86

Where K is a factor depending on the end conditions and is .50 for both ends fixed and 1.00 for both ends free. For average conditions K is taken between .75 and 1.00.

In the Compression formulae the expression in brackets is the ultimate compressive unit stress and the coefficient .40 indicates the factor of safety of 2½.

	Alcan 26S-T	Alcan 65S-T
Shear	12,500	10,000
Bearing	30,000	20,000
For Rivet Alloy 16S-T	Basic Shear 10,000	

No "allowable bearing" for rivets was specified, but in the case of their bearing on "thin" plates, the basic shear values were reduced.

Allowable Stresses for Combined Loads—The probability of maximum stresses resulting from live load, wind, and the extremes of temperature, all occurring at the same time, is exceedingly remote. Consequently, it was decided, for the various combinations of loads, to multiply the normal allowable unit stresses by the following factors:

For Arch Ribs:

D.L. & L.L....................	.90
D.L., L.L. & Wind or Temp....	1.15
D.L., L.L., Wind & Temp.......	1.40
D.L. & Alt. L.L.................	.90
D.L., Alt. L.L. & Temp.........	1.40

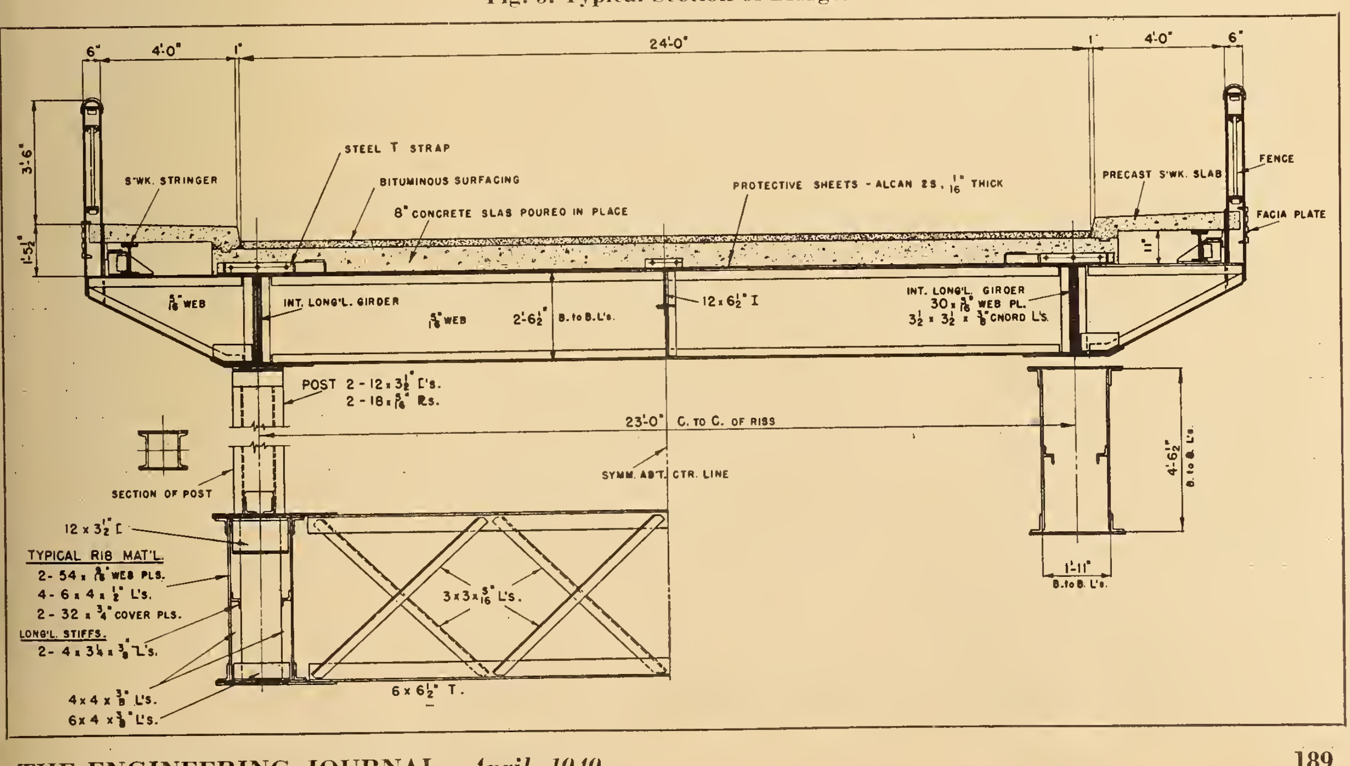
The above factors include an allowance for the "secondary stresses" due to rib deformation. This point is discussed under the part of the paper dealing with the design of the ribs.

For Floor Members and Posts:

D.L. & 1 Truck................	1.00
D.L. & 2 Trucks	1.25
D.L., 2 Trucks & Temp.........	1.50
D.L. & Alt. L.L................	1.25
D.L., Alt. L.L. & Temp.........	1.50

Allowable unit stresses for other elements of the structure were similarly increased.

Fig. 3. Typical Section of Bridge.



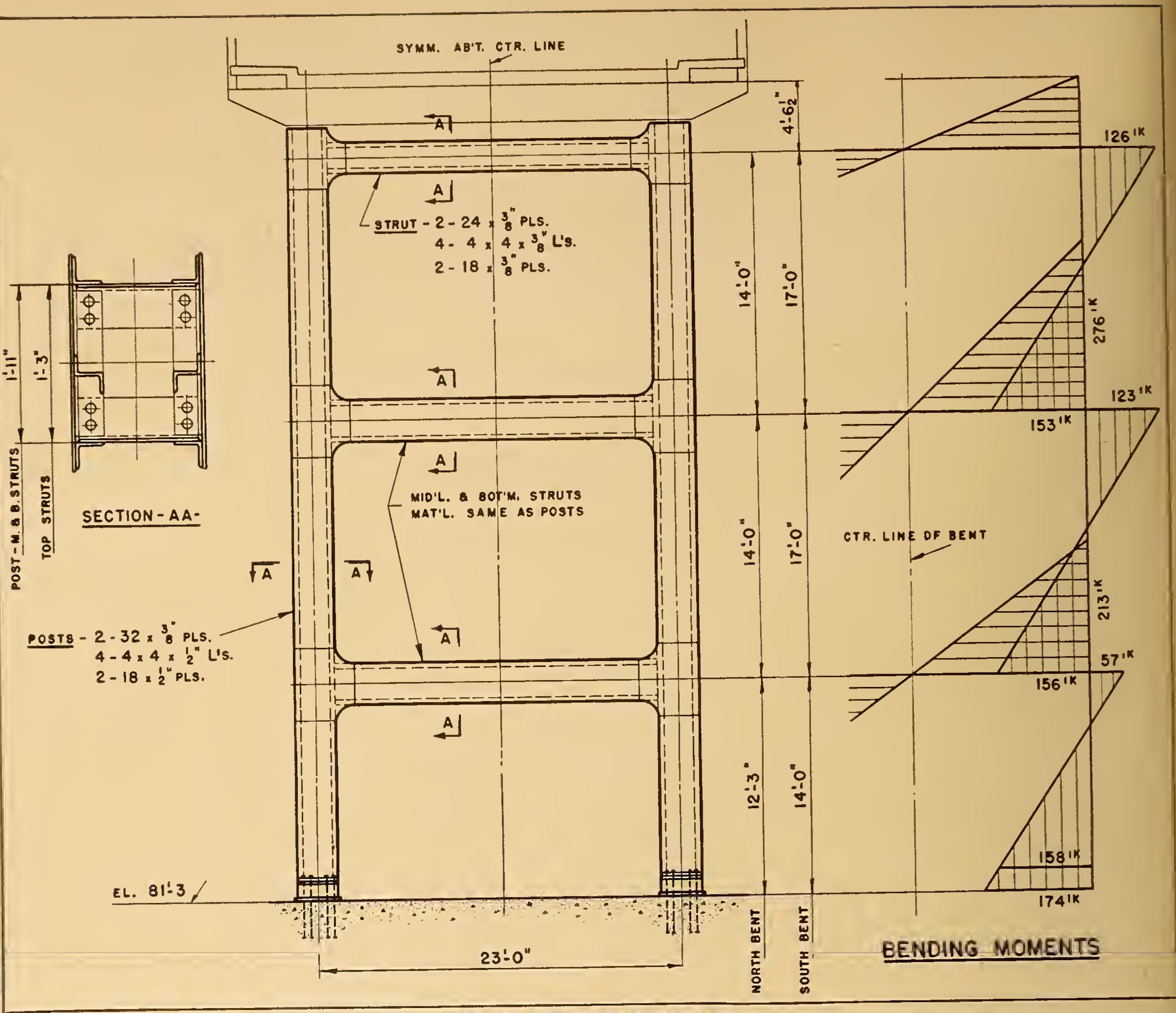


Fig. 4. Bents at Skewbacks.

Floor Slab — To eliminate the possibility of aluminum being brought into contact with wet concrete the design was developed on the basis of precast concrete slabs. Supported on all four sides and measuring 10 ft. x 12¾ ft. x 8 in. thick, the panels were designed with two-way reinforcing. Two schemes of joining the slabs were investigated. One was to leave them in no way connected, merely filling the joints with a mastic compound. The other scheme was to make a continuous deck by welding the projecting ends of reinforcing bars and grouting in the joints. In the former the wind was assumed to be entirely resisted by the aluminum floor members and bracing; while in the latter, the concrete deck was designed to take the whole load, being about ten times as stiff as the aluminum system. The latter scheme was chosen on the merits of its lateral stiffness and because it would add to the general rigidity of the structure.

The slab was designed for the wind on the deck and on the live load totalling 450 lb. per lin. ft., and was analyzed as a four-span continuous girder supported at the abutments, at the main bents and at the crown of the arch. Rigid supports were assumed at first, and as the design developed the lateral deflections of the arch crown and of the tops of main bents were calculated. These deflections being appreciable, the whole system was refigured, on the basis of elastic supports at the crown and at the main bents. The wind reactions at the supports and their lateral deflections were as follows:

	Unyielding Supports Reactions	Elastic Supports Reactions	Elastic Supports Deflections
At Abutments	15^k	49^k	0
At Main Bents	63^k	33^k	1.4 in.
At Crown of Arch	69^k	61^k	2.3 in.

The maximum moment in the deck due to lateral wind is 4200 ft.-kips, causing a maximum compressive stress in the concrete of about 460 lb. per sq. in. and requiring 10 sq. in. of longitudinal reinforcing at the outer edges of the roadway slabs. To protect the aluminum from the effects of grout or of the moisture that might seep through the concrete slab, sheets of commercially pure aluminum 1/16 in. thick, were called for between the slab and the top flanges of all aluminum floor members. These sheets form shallow troughs, ⅜ in. deep, which were to have been filled with bedding mortar just before the placing of slabs.

The coefficient of linear expansion of aluminum being twice that of concrete, the designers were faced with the problem of differential expansion and contraction of the two materials due to temperature changes. The differential contraction in the length of the bridge for a temperature drop of 100°F was computed to be about 3 inches. If the slab were anchored to the floor members at the crown, the relative slip between them at the ends of the bridge would be 1½ inches, which would result in very serious consequences.

It was decided, therefore, to prevent all relative movement between floor and supporting members by anchoring them to each other; if securely held together at the ends, no tendency to relative movement would exist at intermediate points. A substantial anchorage, combined with the expansion joint in the floor, was developed at each end of the two lines of longitudinal girders. For the maximum drop in temperature the resulting longitudinal force was computed to be 112 kips for each line of girders, and was easily taken by the slab in compression. For the maximum rise in temperature the developed force was about 50 kips, and was resisted by a few additional bars placed in the slab directly over the girders. Perpendicular to the axis of the bridge, the slabs were to be held on the centre line of the bridge, but were to be free at the edges; only a small slip would have been required to relieve temperature stresses.

Due to market conditions, mild steel reinforcing bars were not procurable, and therefore high carbon steel bars were ordered. The latter were not considered suitable for field welding, and the precast slab design was changed to poured-in-place slab. Great care, however, will be taken to protect the aluminum from wet concrete. In addition to the protecting sheets of pure aluminum, the top flanges of all floor members will be painted with bituminous paint, and forms will be made watertight. The change did not affect the floor design except that, no slip being possible, the floor slab, besides being anchored to the aluminum longitudinally was also anchored transversely at the ends of each floorbeam. The sidewalk slab remains of precast construction.

Floor System

Owing to high working stresses and low modulus of elasticity of the material the deflections of members were of some consequence. Every effort was made to keep them to a minimum. For the same reason, where no give at the supports could be expected, it was deemed advisable to use seat connections in preference to ordinary connection angles. It was feared that after many repeated loadings, because of comparatively low ductility of the material cracks might develop in the angles. The floor system being completely integrated with the concrete deck, the temperature effects were of vital importance.

Longitudinal Girders—The principal function of the longitudinal girders is the support of the floor slab and of the mid-panel floorbeams. In addition they have to act as chords of a horizontal truss, resisting lateral wind prior to the completion of he slab. Because at the ends of the bridge the longitudinal girders are rigidly anchored to the slab, considerable temperature stresses are induced in them. In view of this, and also to reduce vertical deflections, longitudinal girders were made continuous over the whole length of the bridge. An added advantage was a contribution to the general stiffness of the structure, the girders over the arch spans acting to some extent similarly to the stiffening trusses in suspension bridges. The ribs being twenty-three times as stiff as the girders, however, this effect was neglected in the proportioning of the latter.

The girders are 2 ft. 6½ in. back to back of angles, built up of 30x5/16 in. web plate and 4-3½x3½x⅜ in. flange angles, except in the end panels where the angles are ½ in. thick. The temperature forces were assumed to act at mid-depth of the floor slab, and were developed into the girders with rigid brackets. The girders pass over the posts, the bearing stiffeners also acting as end connection angles for the floorbeam and sidewalk brackets. There are no intermediate stiffeners. The splices are located in the region of minimum moments, 2½ ft. off the supports.

Floorbeams—The floorbeams are of the same depth as the longitudinal girders. The web is also 30x5/16 in. plate, but the flanges are made of 3½x3½x½ in. angles. The sidewalk brackets are cantilevered at both ends of each floorbeam and are of the full floorbeam depth at their inner ends. The top flange straps are made of steel tees and are connected to the aluminum with galvanized steel bolts.

The floorbeams were originally designed in conventional manner, as simply supported at the ends, except for some relieving moment from the sidewalk brackets. It was felt that the shortening of the top flanges due to either flexure, or a drop in a temperature, or both would be permitted by a slight slip between the member and the floor slab. When, however, the precast slab design was changed to poured-in-place, it became evident that no slip would be possible on account of thorough bonding of the embedded steel straps.

The floorbeam was therefore redesigned on the basis of the top flange being held rigidly at its ends. To develop the resulting thrust, the number of bolts connecting the strap to the floorbeam was doubled and some lugs were added to the tee to give sufficient bearing area on concrete. The salutary effects of the change were a 33 per cent reduction in the maximum positive moment in the floorbeam and a 47 per cent reduction in the maximum live load deflection. The floorbeam material had already been ordered and was not changed.

To minimize the deflection of the bridge floor at the expansion joints, the end floorbeams are supported at mid-span as well as at the ends.

Stringers—The roadway stringers, spanning only 10 ft., are standard 12x6½ in. I-beams. At one end each stringer frames into a panel-point floorbeam which is more or less free to turn slightly and thus relieve the strain on the connection angles. At the other end each stringer is supported on a mid-panel floorbeam, held at the middle of the bottom flange by the intersecting lateral braces. This floorbeam is thus rigidly held against rotation, and the seat type of connection was adopted for this end of the stringer. The beam is free to move slightly on the seat, thus preventing the development of temperature stresses. The stringers in the end panels were made of the full floorbeam depth.

The sidewalk stringers support the outer edges of the sidewalk slabs and are standard 10x5 in. I-beams. Resting on the sidewalk brackets, and being free to expand and contract, they were designed as ordinary simple beams.

Handrail Posts—The handrail

was designed for considerable lateral forces, and special care was taken to develop fully the resulting moments at the bottom of the handrail posts, which are 6x6 in. H-beams. The adopted detail is indicated on the Typical Cross-section, Fig. 3. To prevent temperature stresses and possible distortion, the longitudinal members of the handrail and the fascia are connected to the handrail posts by means of bolts in slotted holes.

Floor Bracing — The floor is braced with single angle diagonal bracing in the plane of the bottom flanges of longitudinal girders and floorbeams.

End Bearings—The floor system is carried on three sliding-plate bearings at each abutment: two under the ends of the longitudinal girders and one in the middle of the end floorbeam. The sliding surfaces are rolled bronze on steel, the bronze plate being connected to the aluminum member above with galvanized steel bolts and separated from it with a sheet of insulating material. The wind shear being 16 kips per bearing, the sliding surfaces are tongue-and-grooved, and the steel bed plate is securely anchored to the concrete.

Expansion Joints—Being held at the crown of the arch, the floor is provided with expansion joints at the abutments. The steel of the expansion joint ties slab and girders to each other; otherwise the floor joints are of conventional design.

To prevent water from splashing on the end floorbeam, a gutter is provided directly under each joint.

Posts—The posts are built up of 2—12 x 3½ in. channels, 10 in. back to back with flanges turned out and of 2—18 x 5/16 in. plates, and are placed with channel webs running parallel to the bridge. For inspection, 6 in. diameter holes spaced 3½ ft., are provided in the web of the inside channel. The actual unit stress is only about half the allowable, as the proportioning was governed by stiffness considerations, the slenderness ratio for the longest post being 86, with the maximum allowable of 90. For appearance and repetition of detail, the same material was used for all posts.

Much thought was given to the design of post connections, both top and bottom. Three different schemes were sketched and studied. One scheme was a post, pin-connected at both ends, the pin at the top running perpendicular to the floorbeam, thus minimizing secondary stresses due to its deflection. The pin at the bottom was turned perpendicular to the direction of the ribs, in order to alleviate bending stresses in the post due to the expansion and contraction of the deck and the breathing of the arch ribs. This scheme was not adopted, because of lack of experience with aluminum pins, fear of their wear, and in the interests of general rigidity of the structure.

Another scheme was to connect the posts rigidly to the floorbeams. It was also dismissed, on account of the cumbersome detail required to develop the end moment, particularly in the case of shorter posts.

The arrangement which was finally adopted was a compromise between the first two: The floorbeam was seated on the posts, but the connections were made "semi-rigid" to provide adequate stiffness under ordinary service load on the bridge. The connections at the bottom of the posts resting on the ribs and the posts themselves, were found to be sufficiently flexible not to produce serious temperature stresses. The posts supporting the approaches rest on steel bed plates. Longitudinal movement of the deck will be made possible by the bending of the posts. Only the end posts, on account of their shortness, were provided with rocker bases.

Main Bents

The Main Bents (Fig. 4), two in number, are located at the ends of the arch span, and in addition to supporting the deck vertically, they also support it laterally. The wind shear carried by each bent, taking into account its own elasticity, is 33 kips, giving rise to bending moments, as shown in Fig. 4. The bents, resting as they do on massive skewbacks, were figured fully fixed at the bases. Each bent is a three-tier rigid frame, adopted in preference to a braced bent because of its pleasing appearance. The posts and the struts are of box girder construction, consisting of 2—32 x ⅜ in. web plates, 4—4 x 4 x ½ in. angles and 2—18 x ½ in. flange plates, except the top struts which are made of 2—24 x ⅜ in. plates, 4 — 4 x 4 x ⅜ in. angles and 2—18 x ⅜ in. plates.

The long dimension is in the plane of the bent, to resist bending moments. The 32 in. plates are stiffened in the middle with longitudinal Z-bars; the posts and the ends of the struts are squared up with transverse stiffener frames. 6 in. diameter hand-holes are provided on the inside of the posts and in the top and bottom plates of struts. The rigid connections at the joints are effected by means of 2—½ in. plates with radiused corners. The bases rest on steel bed plates and are anchored with 8—1½ in. galvanized steel bolts. The base detail is concealed by a thin sheet casing, of alloy Alcan 65S-T.

The unit stresses in the bents run fairly low, since the proportioning of the material was largely influenced by the demands of lateral stiffness. Some of the available stress margin is, however, used up by temperature stresses, caused by the longitudinal movement of the bridge deck. For this condition, the bents were figured as cantilevered from the base, the top moving freely with the deck.

Arch Ribs

Material—The main span of the bridge (Fig. 2.) is a parabolic arch of 290 ft. span and 47½ ft. rise. consisting of two fixed ribs of box girder construction. The ribs are spaced 23 ft. centre to centre. and are braced to each other. Except for the end panels, they are of the same material throughout, and are built up of 2—54x9/16 in. web plates 1 ft. 9⅞ in. inside to inside, 4—6x4x½ in. angles 4 ft. 6½ in. back to back, turned out, and 2—32x¾ in. cover plates. Gross area is 127.95 sq. in. and moment of inertia is 63,740 in.⁴ In the end panels the cover plates are 32x1 in.

The web plates are stiffened at mid-height with longitudinal 4x3¼ in. Z-bars running between transverse stiffener frames which are spaced about 5½ ft. apart and consist of 4x4x⅜ in. angles on the web plates and of 6x4x⅜ in. angles on the cover plates, riveted at the corners to form a rigid frame. There are two such frames under each post, one foot apart, and, the posts being located centrally on the rib, the top horizontal stiffeners are replaced with 12 in. channels, which deliver the load to the rib web plates.

The ribs are spliced at each post, except P7, with shop splices at points P1, P3, P4 and P6 and with field splices at P2, P5 and the crown, the ribs being symmetrical about the crown. The rib sections are faced for bearing. The splices were designed for 50 per cent of compression capacity of the rib and checked for maximum possible tension increased by 50 per cent. The bracing between the ribs consists of struts at the panel points and of diagonals, forming a K-system. Both are of almost full rib depth and are of latticed girder construction, the chords of struts being made of T's, cut from 12x6½ in. I-beams, and those of the diagonals of 10 in. channels. The web system consists of double intersection diagonals, without " verticals ", all diagonals being of 1—3x3x5/16 in. angle.

The bracing is connected to the ribs with lateral plates, and bevelled fills are provided to take care of a sudden change of inclination of the plane of bracing, as compared with the smooth curve of the ribs. To make the interior of the ribs accessible to inspection, manholes with removable covers are provided in the top cover plate of the ribs, near the points P1 and P5.

The bases of the ribs rest on a steel bed plate, 6 ft. 8 in. x 4 ft., and are anchored for maximum moment with 22—2 in. dia. steel bolts, 7 bolts off each flange and 4 off each webb. The bolts at their lower ends are welded to a steel frame, to insure their accurate spacing and setting prior to pouring of concrete. The base detail is concealed with an alloy sheet casing. The abutments deliver the arch thrust to solid rock and are sufficiently massive to resist the skewback moments.

Hinged vs. Fixed Arch—Considerable thought was given to the choice of arch type. Preliminary design called for a two-hinged arch, but after the rib had been proportioned and its deflections evaluated, it was feared it might prove too flexible for satisfactory performance. For comparison, a fixed rib was designed and its deflections calculated. The deflections of both ribs caused by a 20-ton load were as follows:

	At Quarter-Point	*At Crown*
Two-hinged rib .	3.50 in.	1.20 in.
Fixed rib .	1.64 in.	.78 in.

Because of its considerable greater rigidity, the fixed type of rib was chosen. It was estimated that there would be no appreciable difference in cost between the two types, since the small economy in the fixed ribs themselves would be largely offset by their costlier bases.

Geometry of Rib—In determining the geometry of an arch ring it is usually endeavoured to make its centre line follow the dead load funicular as closely as possible. In the case of a continuously loaded arch this can be realized with accuracy, but in the case of a curved arch loaded only at certain points, the best that can be done is to make the arch curve a mean of the circumscribed and the inscribed curves of the dead load funicular polygon, thus approximately equalizing the positive and negative moments and minimizing them both.

In the case of the Arvida arch, the variation in the dead load concentrations at the posts was small, and it was found that a truly parabolic curve passing through the skewbacks and the crown produced dead load moments that were low compared to other moments. The parabolic curve was therefore adopted.

Analysis—The arch ring was analyzed by the well-known method of cutting it at the crown and replacing the internal stresses at that point with a horizontal thrust, a vertical shear and a moment. By equating the horizontal and vertical movements and rotations of the end of one half of the arch to those of the other, and solving the resulting simultaneous equations, the expressions for the unknown thrust, shear and moment were obtained. These expressions contained summations of terms for the segments of the arch ring, the summations involving the coordinates of the segment centres, segment lengths, moments of inertia and the free moments in the residual cantilever arms due to applied loads.

The rib between the skewbacks and the crown was divided into fifteen segments, and was first analyzed on the basis of constant moment of inertia. The final design was based on the actual moment of inertia.

Dead and Live Loads—Dead and live load stresses were determined by means of influence lines. There were only seven cases of loading, as the unit load was in turn applied at the seven panel points. The resulting horizontal thrusts and moments at all panel points and mid-panel points were tabulated. Maximum positive and negative moments with corresponding thrusts were obtained for all the above points in the rib, both for uniform live load and truck concentrations. In general, the governing moments at the panel points were positive and caused by trucks, whereas at mid-panel points they were negative and caused by uniform live load.

Wind—It was deemed safe enough to assume the lateral wind load as acting on the whole span, thus substantially simplifying calculations. The ribs and their bracing were designed for the wind on themselves plus the lateral shear at the crown from the wind on the deck. This shear was computed taking into account the relative elasticities of the deck and of its lateral supports. The thrusts and moments were arrived at in the conventional manner: the stresses in the bracing diagonals were first obtained from wind shears, and then the vertical and horizontal components of the above stresses were applied to the rib.

Temperature—The arch was designed for a temperature range of 140°F (−40° to +100°). With the average fabricating temperature of +60°F, the usual practice would have been to design the ribs for a drop of 100° or a rise of 40°. In order, however, to minimize the effects of temperature, the " mean " was assumed to be +30°F, thus giving the maximum variation from the mean, either way, of only 70°. This reduced the temperature effects by 30 per cent. As it is, of course, impossible to fabricate the material at +30°F, the fabricating temperature was still assumed to be +60°, but the ribs will be cambered for the difference. The resulting increase in size was calculated, and the ribs will be fabricated that much " large ". After the bridge is completed, however, the ribs will be free from temperature stresses, at 30°F, since at that temperature they will assume their normal geometry.

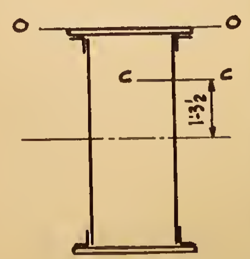
Summary of Stresses

A table of thrusts and moments was compiled for all panel points, mid-panel points, the springing and the crown. Unit stresses in the rib were calculated for three combinations of loads: D.L. and L.L.; D.L., L.L. and temperature; and D.L., L.L., temperature and wind. An extract of the table covering the calculations for the springing, the crown and Point P4, appears in Table 1.

Table I. Arch Rib Stresses.

	SPRINGING									P4				CROWN			
	MAX. THRUST			MAX. + MOM.			MAX. − MOM.			MAX. + MOM.		MAX. − MOM.		MAX. + MOM.		MAX. − MOM.	
	T	M	S	T	M	S	T	M	S	T	M	T	M	T	M	T	M
D.L.	+632K	−38'K	−8K	+632K	−38'K	−8K	+632K	−38'K	−8K	+566K	+103'K	+566K	+103'K	+534K	−47'K	+534K	−47'K
SWK.L.L.	+47	−	−1	+24	+261	−8	+23	−261	+7	+16	+139	+26	−133	+19	+79	+20	−82
RDY U.L.L.	+252	+1	−4	+132	+1410	−43	+120	−1409	+39	+87	+753	+138	−717	+105	+428	+108	−440
TR. & IMP				+76	+998	−28	+53	−1346	+44	+67	+1108	+91	−523	+98	+626	+55	−251
TOTAL	+931K	−371'K	−13K	+788K	+1633'K	−59K	+775K	−1708'K	+38K	+649K	+1350'K	+730K	−747'K	+651K	+658'K	+662K	−569'K
TEMP.	+16	+589	−10	+16	+589	−10	−16	−589	+10	−18	+93	+18	−93	−19	+300	+19	−300
TOTAL	+947K	+552'K	−23K	+804	+2222'K	−69K	+759K	−2297'K	+48K	+631K	+1443'K	+748K	−840'K	+632K	+958'K	+681K	−869'K
WIND	+249	+680		+249	+680		−249	−680		−49	+217	+90	−217	−34	+336	+34	−336
TOTAL	+1196K	+1232'K		+1053K	+2902'K		+510K	−2977'K		+588K	+1660'K	+838K	−1057'K	+598K	+1294'K	+715K	−1205'K
MATERIAL	2 - 54 x 9/16 PLs. 4 - 6 x 4 x ½ L's. 2 - 32 x 1 PLs.			A = 143.95□"			S.M. 0-0 = 2700 S.M. C-C = 4930			2 - 54 x 9/16 PLs. 4 - 6 x 4 x ½ L's. 2 - 32 x ¾ PLs.		A = 127.95		S.M. 0-0 = 2275 S.M. C-C = 4110			

UNIT STRESSES			SPRINGING ACTUAL	SPRINGING ALLOW	P4 ACTUAL	P4 ALLOW	CROWN ACTUAL	CROWN ALLOW
AT 0-0	D.S.		+ 7320		+ 5070		+ 5090	
	BEND		± 12900		± 7120		± 3470	
	TOTAL		+ 20220	1.4 x 17000 = 23800	+ 12190	11830	+ 8560	11830
AT C-C	D.S.		+ 7320		+ 5070		+ 5090	
	BEND		± 7060		± 3940		± 1920	
	TOTAL		+ 14380	1.4 x 11550 = 16200	+ 9010	10400	+ 7010	10400



NOTES. T = AXIAL THRUST   M = BENDING MOMENT   S = SHEAR.
L.L. FIGURES WHICH DO NOT GOVERN ARE CIRCUMSCRIBED THUS
THRUST & MOMENT COMBINATIONS WHICH GOVERN ARE UNDERLINED
ALL UNIT STRESSES IN LBS. PER SQ. INCH.

The resulting unit stresses were alculated at two points in the rib ross-section: at the extreme fibre, vhere the allowable stress is govrned by the width-thickness ratio f the cover plate, and in the web late, some distance off the toe of he flange angle, where the allowble stress is governed by the simlar ratio of the web plate. The hears were found to be of no conequence.

Stresses, due to rib shortening re also not listed. Such stresses ue to dead load thrust will be ullified by cambering the ribs. In ddition to the already discussed emperature camber, the ribs will e fabricated "long" by an mount necessary to counteract heir eventual shortening due to ull dead load. The live load thrust lue to partial loading of the span or maximum live load moments, is elatively small, and the stresses rising from the rib shortening due o it are of no importance.

Deformation Stresses—In the nethod of arch analysis referred o previously, the deflections of the rch rib are neglected. Actually he rib does deflect, thus changing lightly its own geometry and causng a change in internal moments. n arches of average span this ffect is small and can be safely eglected. In the case of the Arvida rch, however, despite the fact that he span is comparatively short he effect of rib deflections was inestigated because of the low Modulus of Elasticity of the materal. The process (by the method of uccessive approximations) being uite laborious, the calculations vere made for only two points, the rown and panel point P4.

The bending moments in the rib lue to any one loading were first obtained by means of influence lines, and from these moments the leflection curve for the rib was plotted. The effect of these deflections on the rib was obtained by multiplying the thrust at any point by the radial component of deflection at that point, and then applying these moments to the rib as external forces. The induced "secondary" moments in the rib and the resulting "secondary" deflections were then computed. The latter were so small that the process was not carried any further, but the figures indicated that in the worst case the total "secondary" moment would not exceed 14 per cent of the original moment.

It was deemed reasonable to make an overall allowance for the effect of rib deflection by means of a 10 per cent reduction in the permissible unit stresses in the rib figured in the usual manner. The advantage of the fixed arch over the hinged one became even more apparent at this stage, when it was estimated that these "secondary" stresses in the latter might run as high as 30 per cent of the figured stresses.

Riveting—The structure will be riveted with cold-driven rivets, 51/64 in. dia., of Alcan Alloy 16 S-T. Shop rivets where possible will be pressure driven, while all field rivets, as well as the shop rivets, inaccessible to the riveting machine will be driven with a heavy pneumatic riveting gun. Originally the field connections were to have been field bolted, as it was considered impractical to drive cold aluminum rivets of this size with a gun. A programme of rivet testing was, however, carried out, jointly by the Aluminium Laboratories Limited and the Dominion Bridge Company, the result of which was the development of a satisfactory technique of driving cold rivets with a gun. A new type of driven rivet head was also developed and was named "annular". The manufactured head is a modification of the usual button type.

Protection of Aluminum — Although aluminum alloys have excellent weather resisting qualities, where surfaces are in contact with other metals, or even with each other, in presence of moisture, there is some danger of galvanic corrosion, unless proper precautions are taken. Even a thin layer of some neutral material such as bituminous paint, is considered adequate to prevent it. Consequently all aluminum surfaces in contact will be covered with a coat of Alumilastic of brushing consistency, containing 5 per cent of zinc chromate. In the case of the connection to the bronze sliding plates at the ends of the bridge, this precaution was thought insufficient owing to possible accumulation of dirt, and a sheet of fibrous insulating material ⅛ in. thick was called for between the aluminum and the bronze.

When completed, the bridge will be thoroughly cleaned but will not be painted. Nevertheless, accessibility has been provided to all parts of the structure, so that if desired it could be painted at some future date.

Acknowledgments

The author made the design computations and developed the principal details of the structure, with suggestions and advice from other engineers in his company. He also received valuable advice from other sources and would like to express his appreciation to Mr. W. L. Pugh, chief engineer, Aluminum Company of Canada, and his staff; The Aluminium Laboratories, Limited; Mr. R. A. Lemieux, city manager of Arvida, and to Mr. E. Nenninger, consulting engineer, of the firm Surveyer, Nenninger and Chenevert.

Appendix I

The following data was taken from the "Handbook of Aluminum Alloys" published by the Aluminum Co. of Canada, Ltd.

Physical properties common to all structural aluminum alloys

Specific Gravity	2.70
Coefficient of Linear Expansion	.000012 to .000013 per 1°F.
Modulus of Elasticity	10,300,000 lbs./sq. in.
Modulus of Rigidity	3,800,000 lbs./sq. in.

Chemical Composition, showing the percentage of principal alloying constituents

	Alcan 26 S	*Alcan 65 S*	*Alcan 16 S*
Cu	3.9 — 5.0	0.15 — 0.4	2.0 — 3.0
Fe	1.0	0.7	0.7
Mg	0.2 — 0.8	0.8 — 1.2	0.2 — 0.5
Mn	0.4 — 1.2	0.15	0.20
Si	1.2	0.4 — 0.8	0.70

Mechanical Properties (Minimum) in lbs./sq. in.

	Alcan 26S-T	*Alcan 65S-T*	*Alcan 16S-T*
Ultimate Strength in Tension	60,000	38,000	38,000
Yield Strength in Tension	50,000	35,000	18,000
Elongation	7%	10%	27%
Ultimate Strength in Shear	35,000	24,000	28,000

Mining Process

Applied To

Runway Construction

by

S/L **C. V. Trites, M.E.I.C.**
and
S/L **J. D. Shannon,**
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A paper prepared
for publication in
The Engineering Journal

The runway project now under construction at Rivers, Manitoba, is believed to have the strongest pavement built to date in Canada. It is also the first to be designed and constructed by the R.C.A.F. This paper describes the method used by R.C.A.F. engineers to make high quality concrete aggregates from low quality local gravels obtainable near the airport.

Postwar defence planning included the siting of an air school for joint training at Rivers, Manitoba. The requirements stipulated surfaces capable of supporting 180,000 lb. aircraft, 6,000 ft. long and capable of extension to 10,000 feet; width to be 200 feet, with 50 ft. shoulders to support 40,000 lb. aircraft. The site had been a navigation school during the war, and had three asphalt runways of low bearing value, taxi strips and aprons. These existing pavements were to be removed if necessary, or retained for continued use by light aircraft.

The plan of the new runways is shown in Fig. I. Specifications were prepared and tenders requested for the construction of only one runway, the Northwest. This contract was later extended at re-negotiated prices to cover the whole of the programme.

Alternative Sources For Aggregates

The concrete runway system, now partly completed, requires a total of 120,000 cubic yards of concrete. The closest commercial source of suitable natural aggregate was Birds Hill near Winnipeg, a rail distance of 165 miles. The present freight rate on gravel is $2.51 per yard, with prospect of a further increase. Transportation has therefore been, a major item in the cost estimates. To keep costs down, engineering curiosity was directed to the treatment of local gravels with the hope that a method could be devised to make this material suitable for concrete.

In general, the agricultural part of Manitoba west of Winnipeg, and extending into Saskatchewan, has scattered sand areas containing small and medium deposits of gravel. These are not water sorted gravels and the deposits contain a variable amount of harmful shale. Deposits in the vicinity of Rivers contain approximately 2 per cent of shale in the plus 1 inch range, 5 per cent in the 1 inch to 10 mesh range and 20 per cent in minus 10 mesh. These deposits also contain a small amount of rotten granite and a minor amount of drip coating in the upper portions.

In many parts of Canada, construction engineers are frequently faced with unsatisfactory sources of aggregate supply. This paper describes an entirely new approach to the problem of assuring excellent concrete, by providing suitable aggregates through separation by the flotation method, as used in the mining industry for cleaning coal and treating coarse ores. To R.C.A.F. engineers goes the credit for first adapting this process to material of low initial value such as gravel.

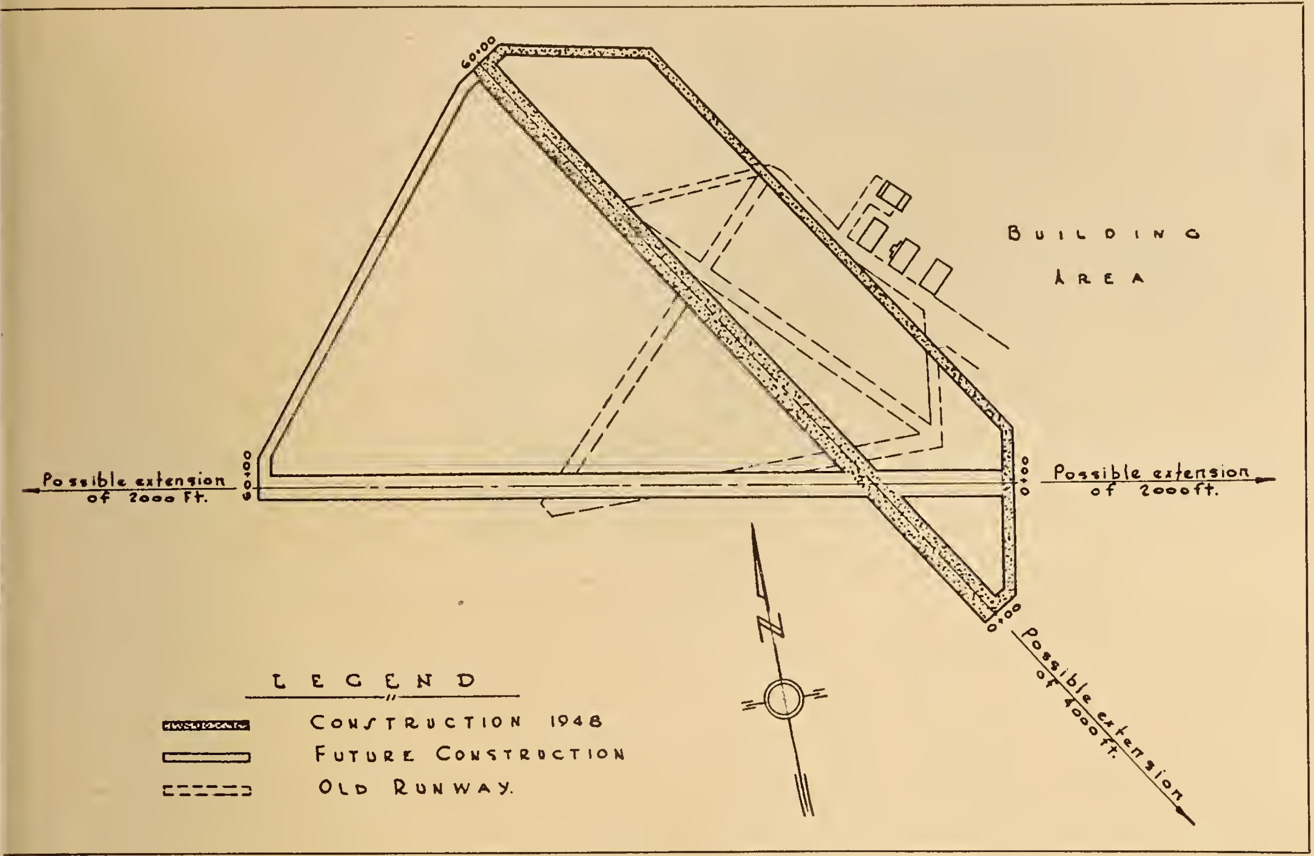


Fig. 1. Plan for improved runways at Rivers, Manitoba.

caused by evaporation from the underside of the pebbles. The remaining constituents are hard granite, quartz and silicified limestone.

Preliminary testing indicated that the crushing and screening operation necessary with any process of separation would reduce the rotten granite to competent sand particles, because the weakness was on the grain boundaries. At least it would reduce it to a fine sand fraction that could be wasted if necessary. It also appeared probable that the weaker coatings would be removed in this manner, and that the stronger coatings would have no ill effect. The main problem was therefore the removal of the shale.

The Birds Hill aggregate is principally a medium limestone. Preliminary tests indicated that 4500 lb. concrete could be made from this material, and it was used for most of the 1948 season. However, the flexural strength on test did not maintain the normal ratio to the high compressive strength, reaching only 630 lb. per sq. inch at 28 days. It was noted that the normal break was across the coarse aggregate, indicating that the low flexural strength reflected weakness in the aggregate. Birds Hill could supply only 1½ inch maximum size, whereas the size required is 2¼ inch.

The search for a method of eliminating shale was therefore encouraged by the probability that the harder constituents of the local gravel would make a stronger concrete, and by the evidence that 2¼ inch maximum aggregate could be obtained.

Flotation Method Chosen

The obvious basis for elimination of shale was specific gravity. The shale has a specific gravity of 2.0, while the usable minerals have a specific gravity greater than 2.6. Attention was directed, therefore, to a separation based on this characteristic, specifically to the sink float or heavy media type of separation.

The process of separating coarse minerals by difference in specific gravities, using a finely ground heavy mineral suspension in water, to simulate a heavy liquid in which one mineral will float while another sinks, has become fairly well known to the mining industry during the last fifteen years. It is still, however, a new process, perfected during the last few years, and now being adopted on a large scale for cleaning coal and raising the grade of iron ores. Lately, it has proved its value to small mining enterprises treating coarse ores. This project is the second to use the process in Canada; it is the first anywhere to use the process on material of such low initial value as gravel. It was estimated that gravel would have two advantages over coarse ores in the process, in that the rounded shapes would allow easier flow and that there could be no accumulation of midlings in the cone.

The heavy liquid processes use either magnetite and ferrosilicon, or galena, as heavy mineral, since these are easily recovered by magnetic separation or by flotation. It was decided to use the magnetite process because of the present high cost of galena, the relative indestructibility of magnetite, and because of the possibility that even tiny amounts of lead sulphide may have an ill effect in concrete.

A deposit of suitable gravel was

Fig. 2. The Mobil Mill in operation.

discovered in the fall of 1947 about 4 miles from the airport. After completion of exploration and preliminary tests, Maintenance Command, which controls construction for the R.C.A.F. authorized the forwarding of a 1,000 lb. average sample to the laboratory of the American Cyanamid Company at Stamford, Conn. The result of tests was received in April of 1948. For these tests, the minus 10 mesh fraction, which cannot be treated by the standard heavy media process, was eliminated. An evidently complete elimination of shale was easily obtained in the plus 10 mesh portion, using only magnetite and a specific gravity of 2.43. The screening operation to eliminate the minus 10 mesh also effectually disposed of the rotten granite and weak coatings. Approximately 80 per cent of concrete aggregate is plus 10 mesh. The major part of the problem was consequently believed to be solved.

The processed gravel returned from the laboratory was forwarded to Milton Hersey Co. Ltd. at Montreal for a concrete test. As it was considered probable that minus 10 mesh sand could be obtained only from the Birds Hill deposits, sand of this type was used with the process gravel to make concrete test batches. The results showed a density of 156 lb. per cubic foot, using a cement content of 6.7 bags per yard and a water cement ratio of 0.47. Compressive strength was 4170 to 4300 lb. at 7 days, and 5600 to 6300 lb. at 28 days. Flexural strength was 585 to 660 lb. at 7 days, and 780 to 855 lb. at 28 days. An abrasion test on the gravel showed about the same as for the Birds Hill material, but the soundness test was considerably better, the weighted average loss after 10 cycles of soundness test being approximately 3.0 per cent.

Equipment and Plant Needed

On the basis of the above results and the obvious large saving in expense evident from estimates, a recommendation was made to Maintenance Command that the necessary equipment be acquired immediately. It was obvious that construction could not be delayed until the equipment was assembled and in smooth operation, but it was considered that this process could supply a part of the aggregate for 1948 and all of the plus 10 mesh portion for 1949. With this plan in mind, Maintenance Command arranged promptly with A.F.H.Q. and National Defence for the immediate expenditure of $50,000 in U.S. funds.

The equipment ordered was an HMS (heavy media separation) Mobil Mill size 2M manufactured by the Western Knapp Engineering Company of San Francisco. (Fig. II and III) It consists of a structural steel framework with the necessary equipment mounted, the whole being semi - portable. About six days are required to complete the bolted assembly, with a crew of six men. In this case, assembly was delayed because of the slowness in delivery of magnetite, which had to be ground to a close specification, and was obtainable only in the United States with some difficulty. Assembly was completed and test runs were started on August 27th, under the supervision of Mr. Graham Eby, engineer for the North American Cyanamid Company of Toronto.

The plant is erected at the gravel pit. The gravel is mined by shovel or carryall and dumped in a shallow hopper, whence it is delivered by a feeder mechanism onto an elevating belt discharging on a Cedar Rapids vibrating screen in combination with a 36 inch jaw crusher. This is all standard contractor's equipment. The oversize is reduced to 2 inches and the undersize, below 10 mesh, is eliminated by wet screening. The prepared feed from this preliminary plant is delivered by belt to a 7 ft. inverted cone at the Mobil Mill, where it is immersed by height of fall in a medium consisting of ground magnetite, kept in partial suspension in water by slowly revolving arms. The shale portion floats on the medium and is moved by slow centrifugal force to a tangential overflow launder, which conveys it to a 36 inch Allis Chalmers vibrating screen. The heavy portion of the feed sinks through and with the medium to the inverted apex, thence down a 5 inch square pipe to an air lift, which elevates it to the Allis Chalmers screen. It requires about five seconds for material to pass through the cone to the screen. Both sink and float products are fed to either side of a longitudinal divider on the same screen. Ten mesh ton cap screen is used.

The plant was erected 7 weeks before the end of the season. Of this time, only 4 weeks was available because the crushing and screening plant was otherwise in use. Operation on a 3 shift basis was confined to the last ten days of the season. A total of 5500 cu. yards of aggregates was produced.

Plant Operation

The bulk of the medium is drained from the products at the top end of the screen, and returned to the cone through a circulating pump. The remaining magnetite is drained and washed from the products by water sprays and passed to a magnetic separator, which eliminates sand and clay that have entered the circuit. The cleaned magnetite is then pumped ɔ a densifier, which is a screw-ype classifier in which the helix an be raised or lowered as desired. ʾhis item of equipment serves to ĺewater the magnetite and to store t or feed it back to the circuit as ĺesired. In passing back to the one, the magnetite falls through , demagnetizing coil, consequently he particles of magnetite do not locculate in the cone. A small notor generator for the coil, and compressor for the air lift, are he remaining items of equipment. \ flow-sheet is shown in Fig. III.

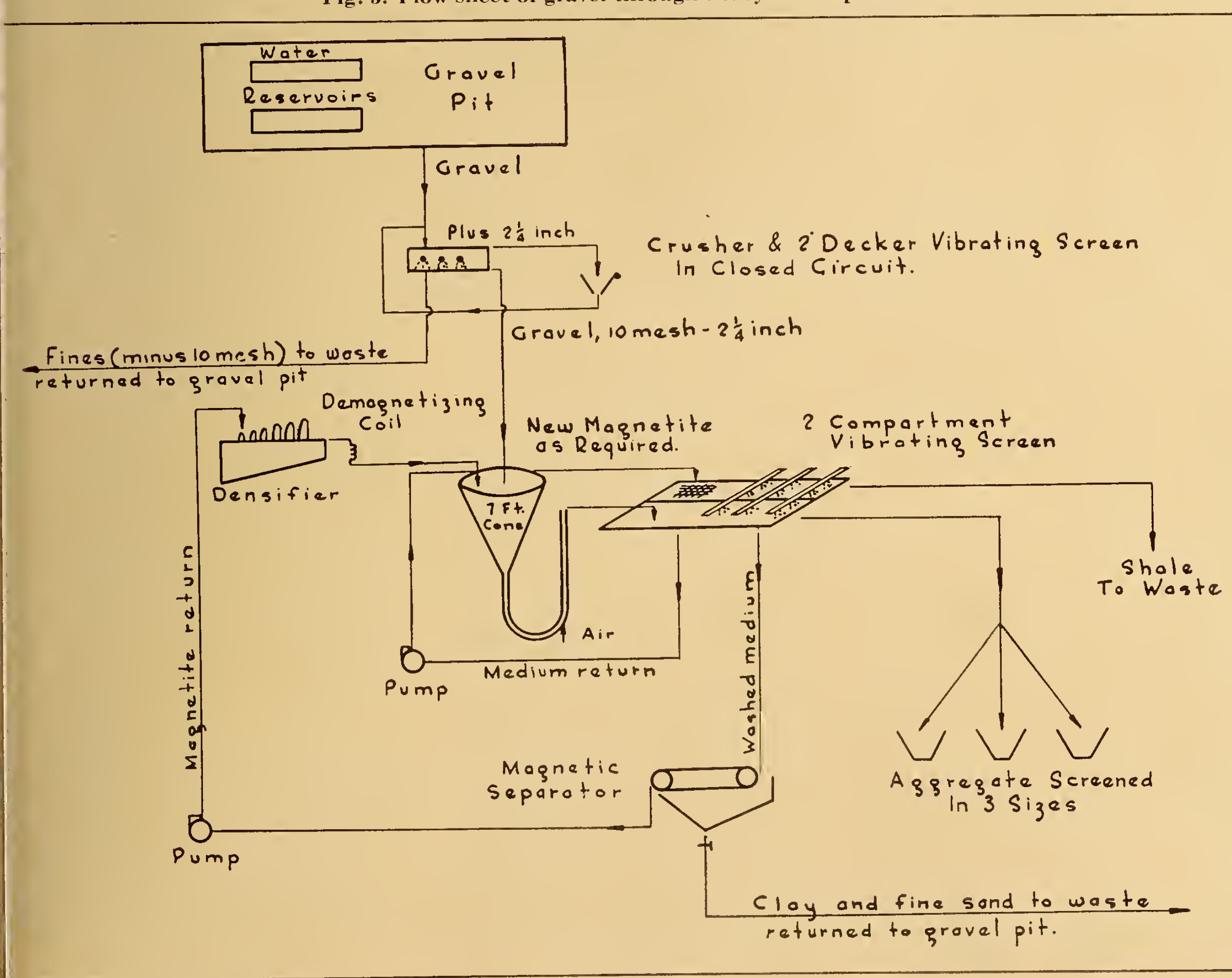
The aggregate side of the screen ıas been double decked, and an ıpron screen added, so that the ɪroduct is divided into 3 sizes as equired for proper proportioning ıt the concrete mixer. The shale ɪroduct is wasted, but may be of ıse as a binder in gravel surfaces. ʀotten granite and weak coatings ıre eliminated by the crushing and ;creening process. Water and power are required to operate the equipment. Electric power was obtained from the Manitoba Power Commission at a distance of one half mile. The Mobil Mill requires 65 hp.

The gravel deposit rests on clay at a depth of 13 feet. As the pit enlarged, reservoirs were excavated in the clay and the seepage, which is small in this semi-arid climate, is yet enough over the large area of the excavations to make up all lost water. All wasted water with its sand and clay content is returned to the pit and loses most of its burden before entering the pools. The water supply pump is placed at the clear end of the reservoirs. The Mobil Mill can operate satisfactorily at less than 200 gal. per yard of product, but approximately four times this amount is required in wet screening to eliminate the minus 10 mesh and launder it back to the pit. The actual loss of water is simply the difference in the water content of the products as mined and as delivered to the bins. An arrangement had been made with the C.N.R. to supply the project with water if necessary from their system, at the town of Rivers a mile distant.

Experimenting Brought Improvements

Initial operation of the plant was not smooth. In addition to shortage of water, due to underestimating the pump capacity required for elimination of the minus 10 mesh, and due to the small size of excavation when the pit was started, there was serious delay in delivery of the fine screens. There was also a difficulty in finding suitable minus 10 mesh sand at Birds Hill. For these reasons, it was decided to eliminate minus ⅜ material until these difficulties were

Fig. 3. Flow sheet of gravel through heavy media plant.



overcome. This required only dry screening and the screens were available. The plant operated successfully on this basis for three weeks. During the last week of the season in October a source of minus 10 mesh sand was found and water, pump and screens were available. The plant was therefore changed to treat plus 10 mesh again and operated with complete success.

The plus 3/8 inch aggregate was used in concrete with sand from Birds Hill for two weeks at the end of the season. It was noted that the concrete finished much better than formerly, though the maximum size was now 2½ inches instead of 1½. There was a small increase in compressive strength, the average of 12 cylinders of the mixed aggregate being 4813 lbs. per sq. inch at 28 days, as compared to 4623 for the same number of cylinders of Birds Hill aggregate under nearly identical conditions.

Operation of the Mobil Mill showed that it does not require an even rate of feed. Sudden changes from no load to full load did not affect the clean separation of the shale. For prolonged shutdown, the magnetite is stored partly in the densifier and partly in the hopper beneath the screen. For a shutdown of several hours, it is most convenient to leave the cone circuit in operation at a slow rate. In case of power failure, perhaps 20 minutes may be required to get the magnetite into suspension again. Plugging of the cone or airlift from any cause is relieved by opening the gate at the airlift and dumping, or partly dumping, the contents of the cone into a sump. The process is essentially simple and nearly foolproof, so trouble is rare.

Subsequent to the initial tests at the Stamford Laboratory, a test was made on the discarded minus 10 mesh sand, to see if the shale portion could be eliminated. The "Dutch State Mines Cyclone" was used for this purpose. For the test, the sand was mixed into the same magnetite medium as used in the heavy media test. It was then pumped under pressure, entering tangentially into a small inverted covered cone. There is no mechanism in this cone, the separation being based on centrifugal force and specific gravity. The heavy sand is drawn off continuously from the bottom apex and the shale is forced out at the top through a pipe at the center.

A good separation was obtained without difficulty and the cleaned sand was tested for concrete by Milton Hersey Co. Ltd. They reported it as very satisfactory. However, considerable capacity in magnetic separators is required, in order to recover the magnetite from the sand products and these separators were not available. Fortunately, in September, a deposit of water sorted sand nearly free of shale and of the right grading was found on a small hill in the middle of the Assiniboine valley 12 miles from the Airport. At the end of the season, 17,000 yards of this sand was mined, transported and stockpiled at the airport for 1949 operations. This sand will be 20 per cent of total aggregates and has averaged in tests 0.15 per cent of shale and 4 per cent silt and clay. Because the coarser aggregates are washed in processing the average of the whole aggregate will be 0.03 per cent shale and 0.4 per cent silt and clay.

The Mobil Mill occupies a space of 28 feet long, 16 feet in height and 14 feet wide. This comparatively small plant produced without difficulty in normal operation 30 yards per hour of aggregate. Capacity of the cone and screen was not reached at any time. At one time the capacity of the magnetic separator to remove slimes and fine sand from the circuit was reached, but examination of the pit at this time showed that the clay over-burden was not properly stripped.

Cheaper Than Nearest Commercial Supply

The normal operating costs of the Mobil Mill are easily estimated. Only one operator is required and a week of training is sufficient. The only tests required are for the specific gravity of the medium at the top and bottom of the cone. With such a considerable difference in specific gravity between the shale and aggregate, supervision is easy. The plant requires 65 hp. in electric motors. The magnetite loss is less than ½ lb. per cu. yard of aggregate produced. Disregarding lost time, these costs total about 7 cents per cu. yard on this project. It is estimated that screen life will range from 5,000 to 10,000 cu. yards. Pump liners will probably be required every 20,000 cu. yards.

It is expected that total operating cost during the coming season will average close to 10 cents per cu. yard. Write off of the plant cost is estimated at 5 cents per cu. yard. Patent costs are in the form of a royalty on production payable to the American Cyanamid Company, which acts as agent for the patentees. The major costs in the project are mining of the gravel, the initial crushing and screening operation and the trucking cost to the airport. The proportion of lost time caused by the Mobil Mill has been negligible to date. Pending detailed costs from a full season of operation, it is estimated that the mining and crushing-screening operations will cost 65 cents per cu. yard for each and 10 cents per mile for trucking, a distance of 4 miles, making a total of $1.70 per yard. These estimates are believed to be ample.

The cost of aggregates loaded into the cars at Birds Hill was 80 cents for sand and $1.40 for coarse aggregate. It is expected that these prices may be increased as much as 20 per cent for 1949. With a present freight rate of $2.51 per yard, the delivered cost for the 1949 season will total $3.90 per yard; in addition there is the cost of unloading the cars at 40 cents per yard, unless they can be unloaded direct to the batcher.

Before removing the plant, a stockpile will be processed for future construction. An investigation will be made to ascertain whether it is worth while to process aggregates for concrete block construction so that materials will be cheaply available for a future building programme.

The heavy media process can be used to great advantage for the beneficiation of poor gravels, if the harmful material can be removed by specific gravity methods. It may be especially valuable in this age of high freight rates. The cost of the process, including royalty, is about equivalent in Manitoba to a truck haul of two miles.

Where Process Is Suitable

In order to decide whether the process can be used successfully on any project, the following should serve as a guide: The deleterious material must be lighter or heavier than the desired constituents of the gravel, but a large difference is not essential. A higher specific gravity of medium can be obtained by substituting ferro-

(Continued on page 206)

UTILIZATION OF WOOD IN THE GATINEAU INDUSTRIES

by

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A paper presented before the Montreal Branch of The Engineering Institute of Canada in November, 1947.

This is a portion only of the original paper presented by the author. The parts here omitted in the interest of conserving space covered woods operations and newsprint production.

Opening with a general description of Canadian International Paper Company's huge mill at Gatineau Point, where some 2,000 persons are employed, the author describes in detail the processes used in the manufacture of fibreboard, masonite, hardboard, and plywood.

The Town of Gatineau is located on the north bank of the Ottawa River, just below the mouth of the Gatineau and about six miles from Ottawa. The first of the industries to be established here by Canadian International Paper Company was their newsprint mill, which was completed late in 1927. Originally designed for a total capacity of six hundred tons of newsprint per day, it is expected that the production rate will soon reach eight hundred tons per day.

The second plant to be built at Gatineau went into operation in June of 1928. This is the mill of International Fibre Board Limited. Its production has also been increased over the period in question, until it now produces about one hundred million square feet of insulating board per year.

In 1940 the plant of the Masonite Company of Canada Limited became the third of the Gatineau group of industries. It has a daily capacity of one hundred thirty-five thousand square feet of hard-board ⅛-in. thickness basis, or enough board to cover an area of over three acres per day. This plant is also being expanded, and its production is expected to be about doubled.

The fourth plant came into production in April, 1946. It produces one hundred and sixty tons per day of bleached sulphite dissolving wood cellulose. As an alternative product it makes one hundred and eighty tons per day of bleached sulphite pulp for shipment to fine grade paper mills.

The fifth plant to be added to the group was the plywood mill of International Plywoods Limited, which came into production in September, 1946. Its capacity is three million square feet, ¼-in. thickness equivalent, of plywood per month. Its product is made from hardwood, whereas, with minor exceptions, the previous four plants mentioned use coniferous or soft wood. This has proved to be desirable in that it means that the lumbering or logging on the company limits is no longer confined to softwood species, and thus full advantage with resulting economies are realized in the woods operations.

Construction is currently starting on a sixth distinct industry, an alcohol plant. As its raw material will be waste sulphite liquor from the sulphite mill, it will not increase the over-all consumption of wood, but will mean more complete utilization of the wood substance now entering the paper mill.

International Fibre Board

The fibre board mill was constructed as a means of utilizing waste screenings from the news mill in the days when screen rejects were normally high, and the demand for insulating board relatively low. As these conditions tended to reverse, it became necessary to augment the stock from the news mill by installing grinders for fibre board, and later by the utilization of sawdust from the news mill chip screens.

With the original installation of the grinders, spruce was available for board stock. Later it became advisable to conserve spruce for the new mill and substitute jack pine. Now the mill grinds poplar and basswood, which have proved very satisfactory, plus about 6 percent pine sawmill slabs.

For stock, a freeness of 650 to 700 is required at the forming machine for easy water removal, and the ultimate product should have the following major characteristics:

1. Strength and proper flexibility for handling on the job.
2. Low density for insulation.

3. Uniformly smooth surface.
4. Texture adaptable to special finishes on a tenoner.

For groundwood stock, a 20 grit open pore alundum stone is used, sharpened with a 2 in. by 2½ in. spiral burr, and operated at a pressure of 45 lb. per sq. in. of stone grinding area. This gives a long fibre with a freeness of 500 to 550, with power consumption of 35 hp. days per ton.

The groundwood stock is screened and, mixed with news mill rejects plus refined sawdust stock, it goes to the fine screens. Rejects from these screens pass through refiners, thence back to the bull screen chest. Rejects from the bull screen itself are passed through a shredder, thence to the bull screen chest. About 7 percent of the furnish is chipper sawdust from the sulphite mill, steamed in a 1000-lb. digester for 30 minutes at 70 lb. pressure, then blown through a hydraulic valve. The steamed sawdust is passed through a disc refiner, thence to the screen chest.

In addition to the above stock, waste wrapper and core ends from the news mill are used to the extent of about 2½ percent of the furnish. This stock is worked up in a continuous beater and pumped to the screen chest. With this mixture of stock, the desired freeness of 650 to 700 is obtained.

The stock is diluted and flows through a conventional flexible sluice into the vat of a unit that forms the board. The drum of the forming unit is 14 feet in diameter, with a 10½-foot face, and operates at 15 in. of vacuum. From the forming unit the sheet passes through the press section, consisting of four spring loaded baby presses and three pneumatically loaded main presses. The press section is equipped with a 40 mesh top wire and a 24 mesh bottom wire.

Leaving the press the sheet is 30 percent dry and calipers 9/16 in. It is then cut to the desired length by a slitter travelling both with the board and transversely. Board length may be varied from 12 to 20 feet. An automatic tipple loads the boards into a ten-level rack, which in turn empties into transfer racks automatically. These are necessary since there are two parallel kilns, one 8-level kiln 348 feet long, and a 10-level kiln of half that length.

The board is carried through the kilns on chain-driven rolls between steam coils at the rate of 32 seconds per foot in the long kiln. Kiln temperatures are maintained at 300 degrees F., at the wet end to 320 degrees at the dry end. Air is circulated through the kilns by a series of high capacity blowers, equipped with pre-heaters.

The board leaves the kiln containing 1½ to 2 percent moisture and calipering ½ in. It is thence conveyed through longitudinal and transverse slitters and cut to finished sizes.

The major portion of the output of the plant is sold for insulating and wall boards, but some of it is converted in the finishing department of the fibre board mill into mouldings for wall and ceiling treatment, and acoustical tile is produced as well. This tile is used for ceilings in offices and other rooms where its sound-deadening effect is desirable and consists of rectangular blocks of fibre board in which holes are drilled.

Hardboard Plant

In the Masonite process of producing hardwood, wood chips are exploded by shooting from guns by high pressure steam. They are then reassembled and welded into dense, smooth, strong and grainless boards, all without the use of binders or adhesives other than the natural lignin in the wood itself. The raw material used at Gatineau is jack pine.

The process takes the name of its inventor, William H. Mason. The story of its discovery as related by the Masonite Corporation is briefly as follows: Mr. Mason, a chemist, had perfected a process for the recovery of naval stores from pine lumber in the dry kilns in the sawmill district in the southern states. He set out to find a means to convert the tremendous waste of slabs and edgings he saw daily going to the trash burners.

Starting from the fact that wood is basically cellulose fibre and lignin binder, he set out to find a means to separate the fibres from each other without breaking or damaging them, first by softening the lignin by heating with steam, then subjecting them to steam under high pressure and separating the fibres by an explosion of that steam. In his initial experiment he drilled a hole into the end of a piece of steel shaft, and filled the chamber with a handful of wood chips and a few ounces of water. He then forced a steel plug into the muzzle of this "gun" and heated it on the outside with blow torches. After he calculated that the temperature within the gun was 800 degrees Fahrenheit, he tapped the plug loose with a long iron bar. The plug was never retrieved, but on the ground were the long fibres that proved wood could be reduced to fibres by an explosion.

It was found that the fibres were too tough and strong to make paper, but these characteristics made them ideally suitable for forming into structural insulating boards. The first experimental boards were made one half inch thick, and dried in a hot platen press used for the determination of moisture content in lumber. Good insulation boards were produced. Then, by accident or fortune, startling results were accomplished. A sample was placed in the press just before lunch time, the gauges were set, the steam turned off, and Mr. Mason went to lunch. The valve which had been turned off developed a sudden leak and when Mr. Mason returned for his sample he had not a half inch board, but, a board one eighth inch thick, smooth, dense and amazingly strong. Thus did Masonite Presdwood come into being.

The wood for the plant at Gatineau is handled and prepared by the wood room of the paper mill, and delivered in the form of screened chips to storage bins or "magazines", and becomes ammunition for the Masonite gun. This 26-in. calibre gun is a forged steel cylinder about 6 ft. long with walls over two inches thick, mounted vertically, with the muzzle pointing downwards.

The gunner charges the gun through an eight inch diameter "breech" in the cover, with a charge of about one tenth of a cord of chips. The breech, or loading port, is sealed by a valve disc placed against its seat on the underside of the cover, and forced tight against the seat by the internal pressure in the gun. The muzzle end of the gun is tapered to six inches in diameter, and is fitted with a series of slots ⅜-in. wide, with total area of about six square inches. The muzzle is sealed by a valve with externally applied hydraulic pressure.

After filling and sealing, steam is introduced into the gun until the pressure reaches about 600 lb. per sq. in., which takes about 40 seconds. The pressure is then brought up rapidly to over 1000 lb. per sq. in., held for a few seconds, and then the discharge valve is opened. The gun blows into a stainless steel cyclone, where the steam and stock are separated. The fibre is dropped out of the bottom of the cyclone into a stock chest, equipped with agitators, and mixed with water to a concentration of one part fibre to 40 parts water.

This mixture is pumped through a battery of refiners, screened to remove the undesirable knots and woody slivers, and is now ready to be reformed into board. The first step is to form a wet lap containing the proper proportions of fibre and lignin binder for the thickness and weight of finished board to be produced. The forming unit is essentially a fourdrinier paper machine. The fourdrinier wire, however, in this machine carries the sheet right through the press section of three sets of top and bottom press rolls.

As the mixture runs over the machine, the fibres are interlaced and felted by the removal of water, by drainage through the travelling wire, and by the use of vacuum boxes, and the presses. The thickness of the wet lap varies when leaving the forming unit from three quarters to two inches, the three-quarter inch lap producing a finished board one-eighth inch thick.

The edges of this wet fibre lap are trimmed, and it is cut into 16-ft. lengths by means of an automatic traversing cutter, travelling along at the same speed as the board. The laps are discharged from a tipple into a stationary rack which holds twenty boards. When the twentieth board is fully in the stationary rack, the twenty are discharged simultaneously into a moveable rack, which is then used to convey the load to the press.

The press has twenty daylights between twenty-one steam heated platens, each heated through telescoping pipes with steam at 180 psi. Each opening has a highly polished chromium plated upper face plate, which imparts a smooth finish to the boards.

The laps are run into the press from the moveable rack by travelling wire screens, which provide for the removal of steam and water during the pressing and drying cycle. A pressure of two thousand tons is applied by hydraulic cylinders, and accurately controlled during the cycle to obtain a close tolerance to specification.

When the drying is completed the press is opened, and the boards are discharged into a moveable rack by withdrawing the wire screen. From this rack they are unloaded and carefully inspected for surface defects. They are then sent to the finishing department for final trimming and cutting to size.

Part of the Presdwood is put through a further tempering process, consisting of subjecting it to treatment with various oils, and later baking at high temperature and humidifying the treated board. This treatment increases the strength, density, toughness and resistance to moisture absorption.

Following are the principal physical characteristics of ⅛ in. Masonite Presdwood and tempered Presdwood.

	Presdwood	*Tempered Presdwood*
Weight per sq. ft. lbs.	.730	.760
Specific gravity.	1.00	1.06
Modulus of rupture p.s.i......	6,000	11,000
Tensile strength p.s.i.	3,500	6,000
Water absorption, per cent. 2 hours submersion	6.0	3.5

Plywood Mill

This mill has been designed to convert one million ft. b.m. of hardwood logs per month into plywood. The average 14 ft. long, 13 in. diameter log scales 101 ft. b.m. In other words, the daily intake of logs will amount to approximately 400 logs or seven carloads per day. The largest portion of the logs is birch, but basswood, elm, maple, ash and other hardwoods are also utilized. Most of the logs come from the Canadian International Paper Company limits, some from local farmers.

The logs are stored in an artificial pond just north of the mill. They are moved in or out of the log pond by a western type skyline, which is really a bridge crane covering a 800 ft. by 200 ft. area, the bridge structure replaced by wire cables. The logs have to be kept under water during the hot seasons to prevent spoilage. Logs can be kept indefinitely under water without deteriorating.

The length of the plywood sheet is determined by the length of the bolt fed to the lathe, whereas the width (measurement across the grain of the face) can be varied in the manufacturing process. The plant turns out plywood sheets in lengths varying from five to eight feet and in three and four foot widths. Consequently logs are cut to these lengths plus oversize for trimming. Most of the product is three-ply, but heavier panels are also made involving more plies (½ in.-five-ply; ¾ in.-seven-ply, etc.).

The logs which come in lengths from 8 ft. to 16 ft., are cut to one of the standard panel sizes (5 ft. to 8 ft.) on a band saw. Since efficient operation is only possible if the lathe cuts a fair number of logs of the same length during a shift, logs are sorted according to length after the saw inside the plant. When a sufficient number of logs in any standard length has accumulated, the logs are carried by a conveyor into one of eight concrete vats, where they are steamed for from 8 to 24 hours, depending on the size of the log and the prevailing outside temperature.

After this treatment, the logs are ready to be cut on one of the two lathes. The lathe converts the logs into veneers. These veneers may be of different thickness from 0.030 in. to 0.250 in. thick. These thin sheets of wood are called veneers until they reach the press and are glued into three-or-more ply panels. The glued product (after the press) is termed "plywood". As the veneer comes out of the lathe, it is clipped to the desired width which is mostly 4 ft. If defects in the logs are too large, the clipper clips the clear part between the defects. The part with the defect becomes fuel, whereas the clear parts will be glued together to make 48 in. width in a subsequent operation called jointing and edge-gluing.

All sheets, either full-width or narrower (called components) are passed through the dryer, and are dried to between 3 per cent and 10 per cent moisture content. The dried standard size sheets are now ready to be pressed into plywood. The components go to the jointer, where their edges are cut straight by two cutter heads, after which resin glue is applied to the joints. After the glue has dried, the components are passed through the edge-gluing machine, from where they emerge in standard width. These sheets meet the originally standard width sheets at the press.

In front of the press the plywood is assembled. The centre lay-

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MANAGEMENT—

TODAY AND TOMORROW

by

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PART ONE

During last year, when the "Notes on Management" section of the *Journal* was first considered, the author was asked to set down, for the benefit of the *Journal's* readers, something of what he believed to be the fundamentals of the whole subject of Management.

With the cooperation of members of his organization he has prepared three concise papers, of which the first is published herewith. It forms a simple and understandable summary of the problem of management as it is today, and is tending, in the opinion of the author, to become in the future.

The other two papers will be published in later issues of the *Journal* and will expand two of the fundamentals considered in this first paper, viz., formal and informal management methods, and management tools and people.

Formalization of Management Practices

In the main, there are three important changes which have taken place in the form of business management over the past century. The first is the formalization of management practices and methods to facilitate control of business. Many can recall the business man who carried all his records in a little black book, personally knew every employee, and whose sole measure of profit was the yearly increases in his bank balance. Contrast this with today's trained professional managers who use modern and sometimes elaborate systems for keeping records, whose employees are scientifically selected by personnel specialists, and whose modern budgetary and cost control systems can tell them at any moment whether profit expectations are being reached and, if not, why not.

There are several reasons for this evolution in management practices. The first of these is growth in size. The larger a business becomes, the more difficult becomes the task of coordinating, directing, and regulating its members and its affairs. Routine and standard policies and practices are therefore developed to relieve management from time-consuming decisions on minor and routine matters. A second reason is competition, under which the alert and progressive survive and profit, and the less able go bankrupt. Because of competition, the cost of production must be reduced, and this calls for better methods of production and cost controls.

A third factor is increasing government regulation, which greatly increases the required number and accuracy of records, and has brought about the development of better record-keeping procedures and office machines. A fourth is the growth of unionization and bargaining powers of the unions, calling for systematic methods for determining wage rates and administering them. Mass bargaining procedures have forced management to develop better production methods, incentives, and training schemes, and to devote more attention to the cares and woes of its working force. A fifth is mass production. As better machines, and mass production techniques produce more and more goods at lower and lower costs, sales production and distribution must be systematically planned and scheduled.

Formalization of management entails more controls, leaving less to the judgment of the individual. Printed policy manuals outline company policies, and company attitudes towards employees, suppliers, and customers. Organization charts define the responsibilities of the various company officers. Standard costs and flexible budgets facilitate the planning of profits. Scientific personnel selection, job evaluation, systematic wage administration, production controls, wage incentives, machine accounting, perpetual inventory controls, and a host of other systems and methods have become part of the business man's language. But formalized procedures should be assigned their proper place—that of a servant and not of a master. They are tools of management. They are the means by which management performs formally a function which it would otherwise have to do informally. Every one of the purposes served by these formal procedures is performed by every manager of every business—no matter how small that business.

When should management substitute formal procedures for informal? This will depend upon the degree to which factors leading to formalization exist in the particular business under consideration. The decision of how far to go is an important one for management. Certain departments may require more formalization than others, depending upon whether the fixed costs there are relatively high or low. A careful analysis of sales revenue in its relation to the fixed costs and variable costs of operation should be made before deciding where to install improvements. In cases where increment profit margin, that is, the difference between sales revenue and variable costs, is large and fixed costs relatively high, the detailed formal aids to the sales manager would probably be justified. On the other hand, if the increment profit margin is low and variable costs relatively high, emphasis must be placed upon cost reduction in the plant, as small decreases in the cost of production will have considerable effect on the profit picture. An expense analysis that will provide such information is important and necessary to each business if management is going to select formal systems intelligently.

Management—A Profession

What of the future? Competition is becoming increasingly more severe. Because businesses tend to grow, we can expect a more widespread use of these techniques, as well as continued improvements and refinements in management controls. A trend is now appearing, particularly in large organizations, towards the establishment of central control staffs attached to top management, whose function will be to keep abreast of developments in management procedures, supervise changes in company practices and coordinate all planning, standardizing and controls.

A second significant change that has taken place in the character of management is the evolution of the professional career manager, as contrasted with the owner-manager of the past. These professional managers are paid a salary for their services and they may or may not own a financial interest in the business. In the old days, the owner of a business was its logical manager—not so today. One of the reasons for this change is that many large corporations today have long since lost their identity with their original owners, and most of them have wide-spread public ownership with no one person or family owning or controlling their policies. Further, the management of larger corporations is highly complex, and only trained and experienced executives can cope with the complicated problems with which they are faced.

Some of the results of this change are interesting. Everyone is now an employee, which implies that all have the same community of interest, namely their mutual protection and welfare, achieved only if all contribute their best. Nevertheless, because the management group represents the owners, there is a distinct division among the company employees. Management now substitutes for capital in the capital-labour combination. It is now management to whom labour turns to settle its grievances or raise its wages. Labour's contacts with the owners or stockholders are now rare. It is organized to promote the interests and welfare of its own group. On the other hand the management employees still largely depend upon individual negotiation with owners or their representatives. Compensations are usually determined by others in the same group at a higher level. Finally the top few men make financial arrangements directly with the Board of Directors. This idea of self-determination of salaries within an integrated group within a company has not been applied to labour-employees. The nearest approach today is the negotiated labour scale where usually an outsider comes to terms with management.

Management as a profession has been recognized, and programmes are being developed to train men specifically for management responsibilities. Such schools as Harvard, M.I.T., Stanford, University of Western Ontario, and many others have installed courses with this end in view. Many corporations have also recognized this trend and have training programmes within their organizations to prepare their future administrators and executives for management.

Human Relations

The third significant trend in management's tasks is the development of a new relationship with labour. This is today the great frontier. Our highly industrialized society apparently often fails to provide adequate motivation and satisfaction to the individual worker, particularly at the lower levels. Recent studies, such as those of Elton Mayo and his associates at Harvard, show the great complexity of the factors involved in motivating our working people.

Underlying these difficult problems connected with labour, there can be discerned some definite developments which are producing problems today compared with yesterday, and which will increase tomorrow's problems compared with today's. One such trend is the increasing education of the labour force. This condition will continue, because illiteracy is still decreasing and today's children are carrying their education much farther than did yesterday's.

Along with this increasing education of the working force is the trend towards mechanization. This means that the working force is now divided into a more skilled minority group which must understand the machinery used, and a much larger majority group in which the individual worker is becoming more and more mechanized, repetitive, and more imitative of the machine itself. Some members of this majority group are naturally adjusted to repetition, but certainly not all of them are. What are we going to substitute for the interest, initiative, and necessity for judgment which was present in the old type of craft work?

Indeed, perhaps a cause for some labour agitation can be found in this condition. A healthy man's mind must be occupied. If it is given a task which does not challenge it, then the mind will fill itself up with extraneous things not relating directly to the work in hand.

In order to give the workman full opportunity to use his talents, he must be brought more and more into the cooperative operation of that part of the business in which he is directly concerned. We are seeing this in some joint labour-management control of such projects as job evaluation and time study, and in union activity through grievance committees, negotiations, and other relations with management. The task for business as a whole is to harness these talents of labour along with management as a team, to promote the general welfare of the business, which in the end will be advantageous to both parties.

This goal is difficult to achieve. It demands, above all, an honest approach by management, and this in many cases has been its greatest weakness. We advocate joint participation in those divisions of management which directly concern conditions of work and pay. We advocate the use of every means possible to awaken the interest of the labour-employee in the company which employs him. We advocate solicitation of these ideas and adequate reward for those which are accepted. We cannot advocate, however, a participation in management by a labour organization.

The adjustment of the human being to the work situation in our increasingly industrialized and systematized society, the diagnosis and correction of situations causing emotional strain and frustration, the adjustment of machines to fit the individual rather than vice versa, and the underlying human reactions are being given considerable study, and will become of increasing importance in the period ahead of us.

Our industrial machine is becoming very complex. There is so much to learn, so much to know, within each facet of business, that no one man can be expected to be an expert in all fields. We can picture in the future development of organization, the provision of staffs of specialists within each of the fields that have to do with the control of material, machines, practices, costs, and last but far from least, human relations. We can expect to see an increasing use of formal management practices and control, and more attention directed to the training of men for professional management careers. We can expect to see management taking part with its workers in more and more cooperative efforts concerning activities with which they may be directly concerned.

MINING PROCESS APPLIED TO RUNWAY CONSTRUCTION

(*Continued from page 200*)

silicon for part of the magnetite, and a difference of 0.1 in specific gravity is sufficient for separation. The materials in the deposit should be naturally proportioned in the correct sizes, or be capable of being made so by crushing and screening without too much cost. A source of minus 10 mesh sand, if required, must be assured either by natural deposits or by one of the treatments described.

Power can be obtained by substituting self contained power units where necessary. Water may be a major problem. As explained, the process does not require much new water, and 30 g.p.m. would probably be ample. It does, however, require a large amount of circulating water for screening out the minus 10 mesh. A settlement area, where the water can drop its burden of clay and sand is therefore essential. If the water table is close to the surface, there will be no difficulty; but if the water table is low, reservoirs may be made in clay, as in this project, or settlement tanks may be necessary. Circular tanks with a raking mechanism would be excellent, but rectangular tanks of fairly small area can be used if cleaned out periodically. The addition of lime or some other settling agent would get rid of colloidal clay quickly.

It is now recognized that materials in aggregate that are harmful to concrete may be also injurious to asphalt. This process should therefore have a considerable future in the gravel industry, particularly for concrete and asphalt road work since it is semi-portable, but also whenever cheaper or higher strength aggregates can be obtained by its use.

UTILIZATION OF WOOD IN THE GATINEAU INDUSTRIES

(*Continued from page 203*)

er of the three-ply is passed through a glue spreader, which applies the adhesives on both sides of this "core". The press has twenty openings, and, depending on the thickness of the panels, one heavier or two thinner panels are pressed simultaneously in each opening. Thus twenty to forty sheets are pressed in one press cycle.

The pressing temperature and press time varies according to the thickness of the panel and adhesives used. With the standard urea resin, two ¼ in. panels are pressed at 245 deg. F. for 6½ minutes. Half the press load is laid up on each glue spreader, ten openings of the press being loaded from one side and ten from the other side of the press. Loading all twenty openings from one side would be too slow, and cause precuring of the glue before the press is closed. After pressing, the plywood is ripped and trimmed to size, then the panels are sanded on three drum sanders and are ready for shipment.

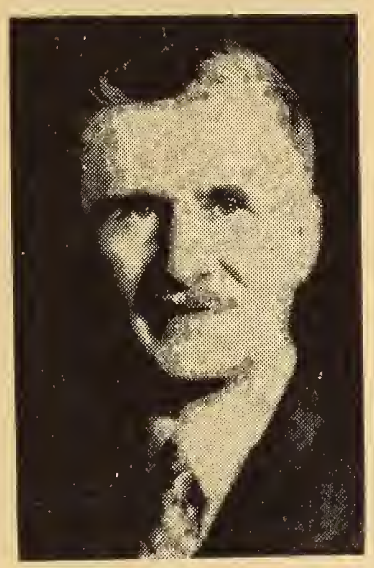
The daily 40,000 ft. b.m. of logs are converted into approximately 100,000 sq. ft. of ¼-in. plywood. The actual yield depends on such factors as sizes and grades required. The thinner plywood is largely used for panelling of walls while the thicker panels are used as cupboard doors, table tops, boxes, spools, etc. and for a great variety of other furniture and general uses.

At present the bark, and the veneers not suitable for plywood manufacture, as well as saw trimmings, are chipped up and burned in the boilers to supply steam to the plant. There are various developments under way to utilize this material in other forms. It may be chipped and used for the core of heavier panels with a suitable binder; part of it may be used for the production of paper or rayon. The birch "cores" which are left over in the lathe after the veneer has been cut off are sold to another company for turning plugs, to be used in newsprint, while the softer cores (poplar and basswood) are used in the fibre board plant as part of their raw material. The defective cores and butts are at present used for fuel wood only.

THE CITY OF QUEBEC IS HAPPY AND PROUD TO GREET THE MEMBERS OF THE ENGINEERING INSTITUTE OF CANADA!

To all the Canadian Engineers who are coming here for the Annual Meeting of the Institute, I extend the warmest welcome! The importance of this gathering which brings together the most prominent scientists of our Country and those more intimately identified with its development, is fully appreciated by every one. It seems to me that it is also well appropriate that it should take place in our City. Quebec is proud of her glorious past, but does not live only on souvenir and history; she is equally interested in the present and the future and is determined to play a prominent part in the industrial and commercial development of our Country. The engineers will certainly be interested in seeing for themselves what is actually being done here in this respect.

I hope that all our distinguished guests will enjoy their stay in our City and bring home a memory that will contribute to make this congress one of the most successful in the history of their association.



Son Honneur le maire de Québec
Lucien Borne

C'EST UN GRAND HONNEUR POUR LA VILLE DE QUÉBEC DE RECEVOIR L'INSTITUT DES INGÉNIEURS DU CANADA!

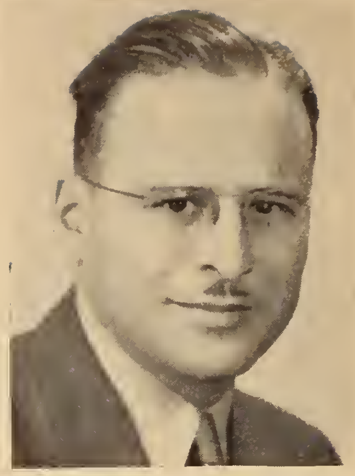
A tous les ingénieurs canadiens qui nous visiteront à l'occasion de son congrès annuel, je souhaite la plus chaleureuse bienvenue! L'importance de cette réunion, à laquelle prennent part les hommes de science les plus en vue du pays et le plus intimement liés à son développement, n'échappe à personne. Il me semble qu'il sied bien qu'elle ait lieu en notre ville. Québec s'enorgueillit d'un passé glorieux, mais ne vit pas uniquement de souvenir et d'histoire; le présent et l'avenir l'intéressent également et il entend jouer un rôle prépondérant dans le développement industriel et commercial de notre pays. Les ingénieurs seront sûrement intéressés à voir ce qui est en voie de s'accomplir chez nous dans ce domaine.

Je souhaite que tous nos distingués visiteurs emportent de leur séjour un souvenir qui contribuera à faire de leur congrès à Québec l'un des plus heureux dans l'histoire de leur association professionnelle.

Lucien Borne

Mayor of Quebec *Maire de Québec*

Alex Lariviere
Vice-President, Zone C
Vice-président, Zone C



Paul Vincent
Chairman, Quebec Branch
Président, Branche de Québec

E. D. Gray-Donald
Councillor, Quebec Branch
Conseiller, Branche de Québec

The executive officers of the Quebec Branch of the Engineering Institute of Canada are pleased to extend a most cordial invitation to their fellow members all through Canada to visit historic Quebec City for the Sixty-third Annual Meeting.

After the opening of the first branch in Toronto, the Council of the Canadian Society of Civil Engineers authorized the formation of the second branch in Quebec in 1907. Started with some forty members, the roll of the Quebec Branch of the Engineering Institute of Canada now numbers well over 300.

In 1927, the Engineering Institute held its Annual General Meeting in Quebec for the first time with very great success when Dr. A. R. Decary was president. The Institute chose the historic capital again for its Annual Meeting in 1944, with Mr. René Dupuis as General Chairman. The appreciation of all those who participated has been so freely given that Quebec has again been selected for the Annual Meeting this year.

The programme will stress the engineering utilization of the natural resources of the oldest and of one of the richest provinces in Canada. Other important engineering fields will be treated extensively, and a special attraction will be the Regional Conference of the International Committee of Scientific Management.

The members of the Quebec Branch sincerely hope that you will be able to attend the meeting and enjoy the noted French-Canadian hospitality from May 11th to 14th next.

Paul Vincent,
Chairman of the Branch and the Annual Meeting Committee.

Les officiers de la section de Québec de l'Institut Canadien des Ingénieurs sont heureux d'être les hôtes de leurs confrères de toutes les régions du Canada.

Le 20 avril 1907, vingt ans après sa fondation, le Conseil Général de la Société Canadienne des Ingénieurs Civils autorisait officiellement la création d'une section à Québec. C'était la deuxième section de la Société, après celle de Toronto. D'une quarantaine de membres à ses débuts, la section québecoise de l'Institut Canadien des Ingénieurs compte maintenant plus de 300 membres.

Le premier Congrès annuel tenu dans la vieille cité de Champlain, en 1927, eut un succès retentissant sous la présidence générale du Dr A. R. Décary. En février 1944, l'Institut choisissait de nouveau la capitale historique de la Province de Québec pour sa réunion générale annuelle, sous l'habile direction du président local, monsieur René Dupuis. Le résultat en fut si éclatant que Québec est encore choisi pour le Congrès général de 1949.

Les sujets qui y seront traités feront ressortir le rôle important de l'ingénieur dans l'exploitation des ressources naturelles à peine utilisées de la plus ancienne et d'une des plus riches provinces du Canada. Des travaux importants de génie et des problèmes d'administration seront aussi l'objet d'abondantes discussions.

Vous êtes donc tous cordialement invités à venir profiter de l'hospitalité traditionnelle des membres de la section de Québec les 11, 12 et 13 mai prochains.

Le président du Congrès et de la section de Québec.

Paul Vincent.

ELECTRICITY from the ATOM

by

Arthur Surveyer, M.E.I.C.
Consulting Engineer, Montreal, Que.

Contrary to common belief, scientists were not solely responsible for the development of atomic energy for military uses. Engineers and industry also contributed to a major degree. The situation was stated very succinctly by Colonel K. D. Nichols, shortly after V-day, who said:

"The public is prone to hail the inventor and the final product and to overlook the engineering and construction that is essential if the idea of the former is to be translated into the latter. The engineering problems . . . were numerous, unique and staggeringly difficult, the time schedule only slightly short of impossible."

The late A. C. Klein, who was in charge of the construction of the Manhattan project for Stone & Webster, declared that:

"If we take the percentage of the whole combined engineering, construction, and research, about 90 per cent of the money was spent for construction and engineering and 10 per cent for research. In addition to construction and engineering, the operating organization are largely staffed by engineers. Probably the percentage there is of the order of 90 to 10."[1]

There is no doubt that if electricity is to be produced from the atom, engineers will play an important part in the designing, building and operation of these plants. The writer hopes that the readers of *Journal* will find in this paper an easy lead to the study of nuclear engineering.

In closing this introduction, it must be pointed out that although the writer was a member of the National Research Council during the war, he was not on the Chalk River staff of researchers. In addition, none of the work undertaken at the Chalk River plant was ever discussed at Council meetings, so that he could not commit any indiscretions.

This paper is subdivided under the following headings:

Discoveries which revealed the existence of atomic energy.
The structure of the atom.
The splitting of uranium.
The wartime atomic pile.
Electricity from the atom.
Estimated cost of atomic electricity.
Latest developments in nuclear power studies.
General conclusions.

AUTHOR'S COMMENT

This paper was originally given in the form of an address to the Spoke Club of The Shawinigan Water & Power Co., on March 3rd, 1948. It was prepared for the purpose of familiarizing the writer with the basic technical features of atomic pile construction and operation, since this knowledge is necessary to appraise the possible repercussions of new discoveries in the field of nuclear energy. It is reproduced here because the generation of electricity from the atom is primarily an engineering task. In preparing this paper, the writer was compelled to study the latest articles and books on nucleonics and he hopes that the difficulties experienced in ploughing new paths through his hardening brain, has enabled him to outline the problem in a manner easily understandable. Needless to add that in preparing this paper, the writer has borrowed right and left, thus working as a compiler rather than as an author.

Discoveries that Revealed the Existence of Atomic Energy

The discovery that there is in the atom frozen energy which might possibly be released goes back to the end of the last century when, in 1896, Antoine Henri Becquerel, Professor at The Ecole Polytechnique de Paris, observed that photographic plates wrapped in a sheet of black paper and placed in a drawer had been affected in the dark, by invisible rays from uranium salts. This was the first demonstration of natural radioactivity, and started the hunt for the explanation of this new puzzle. In the following decade,

[1] "Engineering in An Atomic Era" by A. C. Klein, Engineering Manager, Stone & Webster Engineering Corporation. Presented at the Fall Meeting of A.S.M.E. October 3rd, 1946. Reproduced in *Mechanical Engineering*, December 1946.

Rutherford and others showed that the Becquerel rays were of three kinds which they called alpha, beta, and gamma. At the same time Pierre and Marie Curie, pupils of Becquerel, went on to discover radium, the most strongly radioactive element which they found always present in uranium. The question at the time was how to account for radio-activity, this giving off of faintly charged particles. Rutherford deduced that this energy could be nothing else than the breaking down of the element, a conception which conflicted with all previous ideas and which, as stated at the time, stood the science of physics on its head.

As radium dissipates its energy, it eventually turns into lead, but this natural decay is very, very slow. Dangerous to human flesh and bone as is exposure to radium, a gram of it would release in 100 years only enough heat to boil a small cup of water. So no one did more than dream of trying to utilize such a feeble force.

It was Albert Einstein who, by his prophetic calculation in 1905, made the scientific world realize that there was an unbelievable power which could be converted into energy by the breaking down of the atoms of any matter. His opinion was that mass and energy are different forms of the same thing; that all matter in the universe is locked-up energy, and that all energy (which includes light and heat) is unlocked or dissipated matter. He announced that the energy liberated by a given loss of mass was equal to the mass of the disintegrated material multiplied by the square of the speed of light. Einstein knew no way of unlocking this energy. His prophetic announcement, made more than 40 years ago, that the complete conversion of one pound of anything would yield 11.4 billion k.w.h. of energy, started the scientists on the search which culminated in the explosion of the first atomic bomb, at the Alamogordo test in New Mexico, on July 16th, 1945.

The Structure of the Atom

In order to understand how the atom can be made to release energy, it is necessary to examine the nature of the atoms themselves. All engineers doubtless remember the teachings of their school days, that the atom was indivisible, and that it was the smallest particle in nature. Modern physicists have now shown that it is composed of three different elements, the electron, the proton, and the neutron.

Figure No. 1 shows that the atom consists of a number of negatively-charged electrons flying around a central positively charged body, the nucleus or core. This tiny core is only 1/5000th part of the size of the atom, but it is so dense that it contains nearly all the atom's weight. The rest is empty space enclosed by a cloud of electrons moving around the nucleus much as the earth and the other planets move around the sun. The positively-charged protons and the negative electrons attract each other, but the "electron clouds" are held out in their orbits by the centrifugal force of their great speed, somewhat as the earth is held away from the strong pull of the sun.

For each proton in the core, there is one electron in the cloud flying around the nucleus since plus and minus must balance in the atom. As shown in Figure 2, uranium 238, until recently the heaviest element, has 92 protons, and 92 planet electrons flying around its core, and 146 neutrons.

All engineers remember the atomic weight scale in chemistry, where all elements were given an atomic weight by comparing them with the weight of an atom of hydrogen. The nuclear physicists have added to this notion the *atomic number* or *charge* which indicates the number of protons in the nucleus of an atom, and also the number of electrons flying around its core. The sum of the neutrons and the protons in the nucleus gives the atomic weight.

The chemical behaviour of atoms depends on the number of protons in their cores. Chemically, all atoms which have the same number of protons behave in exactly the same way. It is the number of protons which make one element differ from the other. Gold and mercury, for instance, are as unalike as night and day, yet the difference between them is one proton only. If you could chip off one of the 80 protons in the mercury core, you would have an atom of the gold. This is the transmutation of elements formerly sought after by the old alchemists. In order to change the number of protons in the core of an element it is necessary to break up its atom and modern alchemy has succeeded in splitting the atoms of all the known elements.

There are, however, elements which have the same chemical composition and properties, the same number of protons, but a different number of neutrons, thus giving them slightly different atomic weights. These elements are called *isotopes* and the four principal uranium isotopes found in nature are as shown in Fig. 3; U-238; U-235 and U-234. There is also U-233 which is a man made product and is not found in nature.

The Splitting of Uranium

The natural radioactivity of such elements as uranium is so slow that it is useless. True, artificial energy leaks can be produced by bombarding usually stable elements, but these leaks of atomic energy are also very slow, and furthermore the energy required to break up an atom in this way is much greater than the energy obtained.

It seemed therefore, that although the method of atomic bombardment could produce some atomic transformation to satisfy our scientific curiosity, it was absolutely inapplicable for the purpose of practical utilization of the energy frozen in the atom. The problem thus appeared insoluble until two German scientists, in January 1939, realized what they called "fission" of uranium by breaking down this element under neutron bombardment into two lighter atoms plus some extra neutrons. (See Figure 4 and Figure 5.) Since the sum of the masses of the two light nuclei resulting from this fission was less than the mass of the parent uranium atom, it was evident, according to Einstein's relationship between mass and energy, that this loss of mass would release energy which would appear in the form of the tremendous speeds with which the fragments shot away from the scene of fission.

The Wartime Atomic Pile

The phenomenon of nuclear fission was a discovery. The nuclear chain-reaction pile was one of the major inventions in history. The wartime pile used at Hanford, Wash., to produce plutonium for bombs from uranium, is already mechanically obsolete, yet it reveals the basic principles on which future piles for power will operate. The heat generated in vast quantities by the fission will be utiliz-

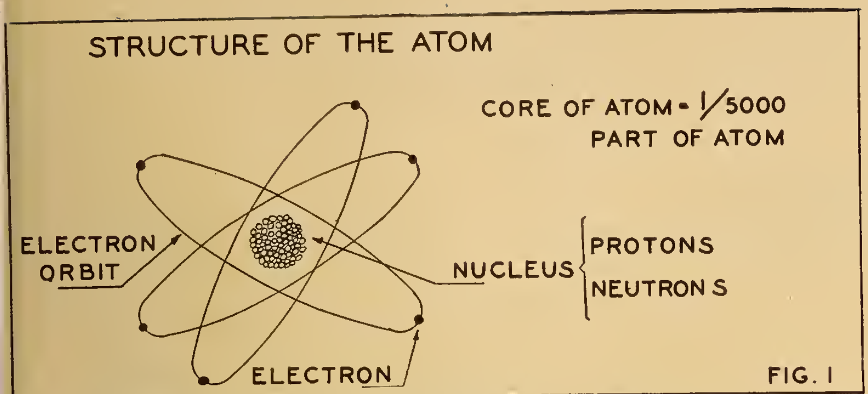


FIG. 1

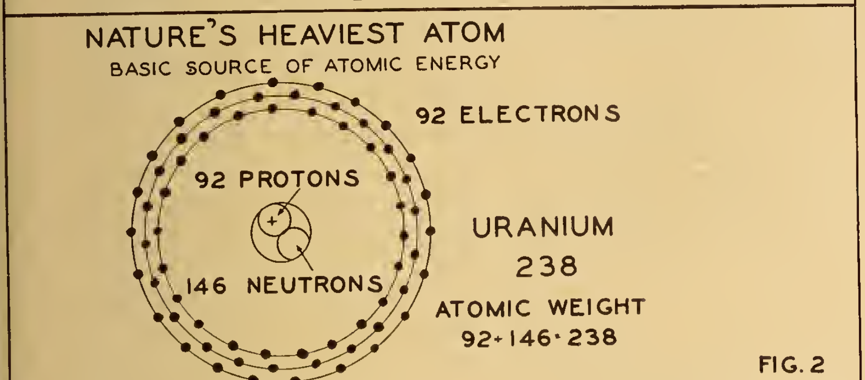


FIG. 2

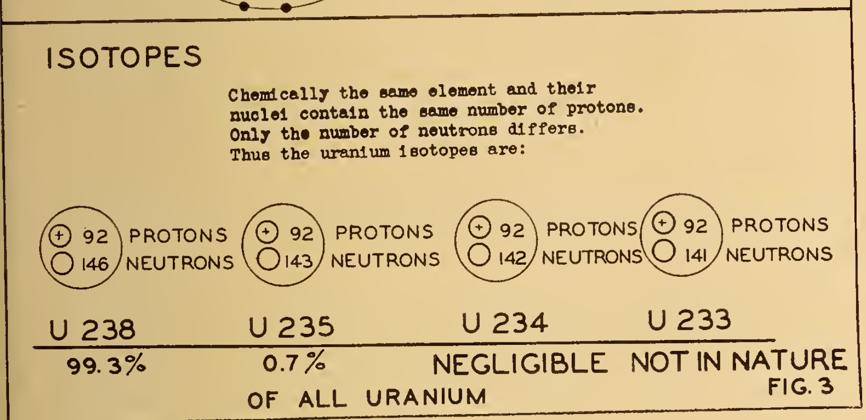


FIG. 3

ed. The plutonium used for bomb manufacture, will be returned to the pile as supplementary fuel. Such a pile is shown in Fig. 6. It is made of graphite which acts as moderator, slowing down the speed of the neutrons from 6000 miles per second to one mile per second, thus making them more effective. Slugs of purified uranium sealed in aluminum cans are placed in correctly spaced cylindrical holes passing through the graphite. To prevent the pile from blowing up, cadmium or boron steel rods are inserted into other holes to act as controls. These rods absorb the neutrons so that when pushed into place they cause the chain reaction to die out from lack of neutrons. When the rods are pulled out to a certain point, the absorption effect is decreased. Without this control the uranium would melt and therefore cooling of the pile is very important. Aside from the cooling and control elements, the pile simply runs by itself once enough material has been put together. It does not even need a "pilot light" to start operation as there are always enough stray neutrons to start a chain reaction.

Thus as long as you put the ingredients together in the right proportions, the mixture will start cooking with its own energy. Over a period of time the contents of the batch in the atomic oven are gradually changed and if a slug is removed after a certain interval, it is found to consist no longer of pure uranium. A small part of U-235 has been transformed into atoms of lower atomic weight, while a little of the U-238 has been transformed through a succession of stages into U-239, neptunium NU-239, and fissionable plutonium PU-239. Plutonium is what we want. (See Figure No. 6.)

The slugs of uranium which have to be removed from time to time, contaminated as they are with radio-active fission products and rich in poisonous plutonium, must be handled with the greatest care. One of the important phases of the Manhattan Project was the development of remote control techniques for the chemical separation of plutonium and the fission products from the uranium metal.

The manufacture of plutonium is a milestone in human history. It is the product of alchemy, the transmutation of elements on a scale large enough to be industrially important and militarily decisive.

Electricity from the Atom [2]

To bring the energy released by the fission of the atom into a readily manipulated and transportable form, it is necessary to convert it into electrical energy. The most specific description of a practical atomic power plant officially released comes from the Clinton Laboratories at Oak Ridge, Tenn. It is reproduced as Figure No. 7. It shows an atomic furnace placed in a thoroughly shielded structure. In it may be seen blocks of uranium embedded in a moderator, just as in the piles used for the production of plutonium.

The nuclear power unit consists of a pile for producing heat, a recirculating cooling medium, either a liquid or a gas, and an electrical generating plant. The recirculating cooling medium will carry heat from the pile to the generating area, where the heat will be picked up by a heat exchanger and converted into electrical power by the conventional equipment. Alternatively, the cooling medium might be a gas and might drive a gas turbine in the generating area.

One of the first problems with which the engineer must cope in the design of a nuclear power unit is the selection of the coolant or heat transfer medium. First of all, the medium must resist the great neutron bombardment in the pile without having an appreciable fraction of its mass converted into some other element altogether. Strange things happen in a pile. Nitrogen, a gas, comes out as carbon; silicon comes out as phos-

[2] See "Atomic-power Engineering—Some Nuclear Problems" by Alfred O. C. Nier, and "Atomic-power Engineering—Some Design Problems," by Bruce R. Prentice, *Mechanical Engineering*, September, 1947.

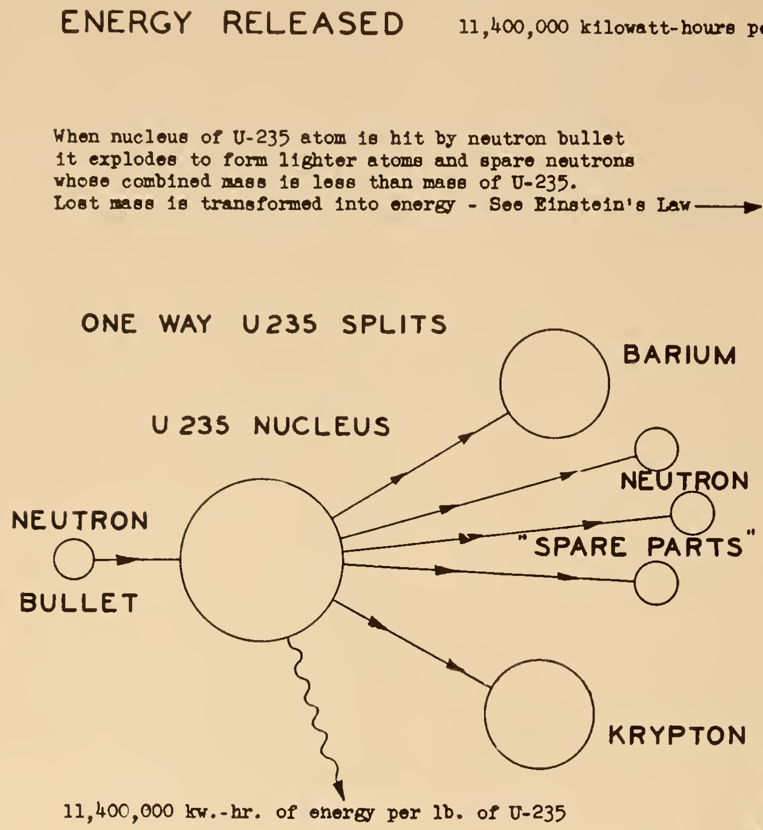


FIG. 4

EINSTEIN'S LAW:

One pound of anything = 11,400,000,000 kwh.

when $\left.\begin{matrix}\text{mass}\\ \text{or}\\ \text{energy}\end{matrix}\right\}$ converts to $\left\{\begin{matrix}\text{energy}\\ \text{or}\\ \text{mass}\end{matrix}\right.$

Applying this law to U-235 split:

Explosion products of one pound of U-235 weigh 0.9990 lb., so 0.001 lb. of the mass is converted into

0.001 x 11,400,000,000 = 11,400,000

kilowatt-hours of energy.

FIG. 5

phorous; gold comes out as mercury. The second requirement in the choice of the heat transfer medium is that it should not be unduly corrosive and should remain liquid at high temperature and under relatively low pressures.

Third, the medium must not poison the reaction by absorbing an excessive amount of neutrons, since neutrons are the life-blood of the pile operation. Therefore, only a small amount of coolant can be allowed in the pile. Obviously then, heat loads will be very high, and the design of the cooling passages and arrangement of heating elements in the pile itself involve some advanced heat transfer engineering. Equipment for handling the coolant outside the pile also presents problems. While the temperature of the fluid might cause it to be a fire or health hazard, most of the major design problems are caused by its radioactive nature.

Naturally there must be a pump in the system to circulate the coolant. Since the pump is handling the radioactive fluid it too will become radioactive, and it will not be possible to approach it, except after a prolonged shut down. This means that there will be no normal maintenance allowed, no packing of the glands for example. The problem of finding a gland that does not require repacking, yet is able to hold a thermally hot liquid, several hundred degrees perhaps, is a difficult one, especially when we realize that this radioactivity of the cooling medium may damage and eventually disintegrate the packings. The pump must be absolutely reliable. If the pump failed and the heat transfer medium were to stop circulating in the unit, the heat would build up so rapidly that excessive temperatures might be reached in the pile and necessitate a shutdown. A multiple pump unit will probably be used, with a spare in parallel, standing idle but ready to pick up the load. Although a pile cannot explode like an atomic bomb, adequate controls are necessary to keep the pile from running away and getting hot enough to melt.

Shielding of nuclear power will be a most complex problem on account of the intensity of radiation. Shields are not just a mass of concrete as so many people think, but are very carefully engineered structures which incorporate a great deal of ingenuity and plain horse sense. In addition to the high level of radiation, the high temperature in the new units will cause thermal expansions of the various parts, and all this must be compensated for in the shielding design. The shields too will undergo thermal expansion, for they operate by stopping the radiation and turning it into heat. Many holes will pierce the shields for process tubes, controls, and so on, and each hole itself must be properly shielded to prevent escape of radiation.

Instruments will be required for the pile itself, to show power level, neutron intensity, and other major operating variables, and to give indications of trouble if any develops. This instrumentation will be a major electrical engineering job, for this equipment must be rugged and reliable. The safety instrumentation will be particularly important. In case of trouble, control rods shut down the unit automatically, and other necessary safety equipment must be actuated. This instrumentation must be fool-proof and it must operate on currents as feeble as micro-micro amperes.

If the fuel of the atomic furnace is natural uranium, it will do two things: in addition to generating power from the fission of U-235, it will be producing plutonium through the conversion of U-238. But plutonium itself is a nuclear fuel. Thus, while generating power, the atomic furnace will be at the same time manufacturing a new fuel, and thereby will continue to regenerate itself. This process of conversion called "breeding", means that ultimately not only U-235, but also U-238 is used as a fuel. The plutonium PU-239 produced may be used in the same furnace or be shipped out to another one.

There is on Figure No. 7 a schematic arrangement of the principal parts in a chain reaction pile:

1. Uranium fuel, containing U-235 (fissionable material) and U-238 (fertile material for the production of PU-239) in arbitrary proportions.
2. Moderator for slowing down neutrons.
3. Reflector for conserving neutrons.
4. Shield for protecting power plant personnel.
5. Heat transfer fluid or gas for transporting the heat energy out of the nuclear reactor.
6. Control rod for varying the reactivity of the reactor and the power level.

This is a very sketchy description of an atomic power plant and does not feature the many design and operating problems which have to be overcome, many of which are new to the engineering profession. As Professor Alfred O. Nier points out: "There are always formidable engineering problems to be solved before any great scientific discovery is put to everyday use, and in the same way, many bridges must be crossed before atomic energy can be used for practical power production."

Estimated Cost of Atomic Electricity

While no such plant has ever been built, it is felt that a large stationary nuclear plant is possible. It has been estimated that, based on early 1946 costs, a plant designed along the lines indicated and producing 75,000 kilowatts could be built in a normal locality in the eastern United States for approximately $25,000,000. On the assumption that the plant would operate at 100 per cent of load factor, and that interest charges on the investment would be 3 per cent, this plant could produce power at approximately 8 mills per kilowatt hour. This study and the following estimates were made by members of Monsanto Clinton Laboratories staff and the Monsanto Chemical Co. engineering department under the direction of Dr. C. A. Thomas, vice-president of Monsanto Chemical Corporation. The following table I shows in detail the comparison made by Dr. Thomas between the capital and operating costs of a nuclear power and a coal fired electric plant estimated to cost $10,000,000. The operating costs of this plant depend on the price of coal. The price of bituminous coal of

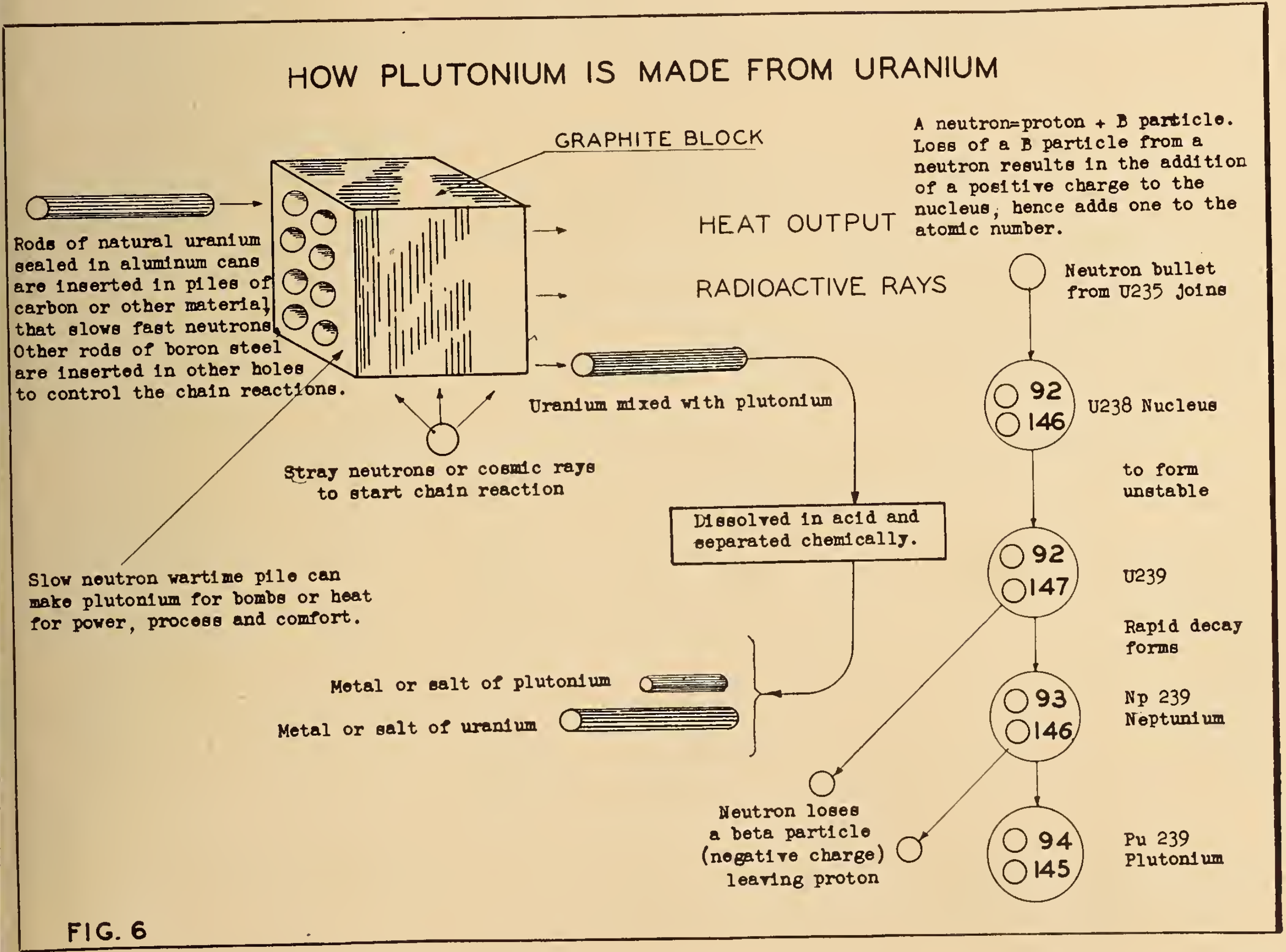
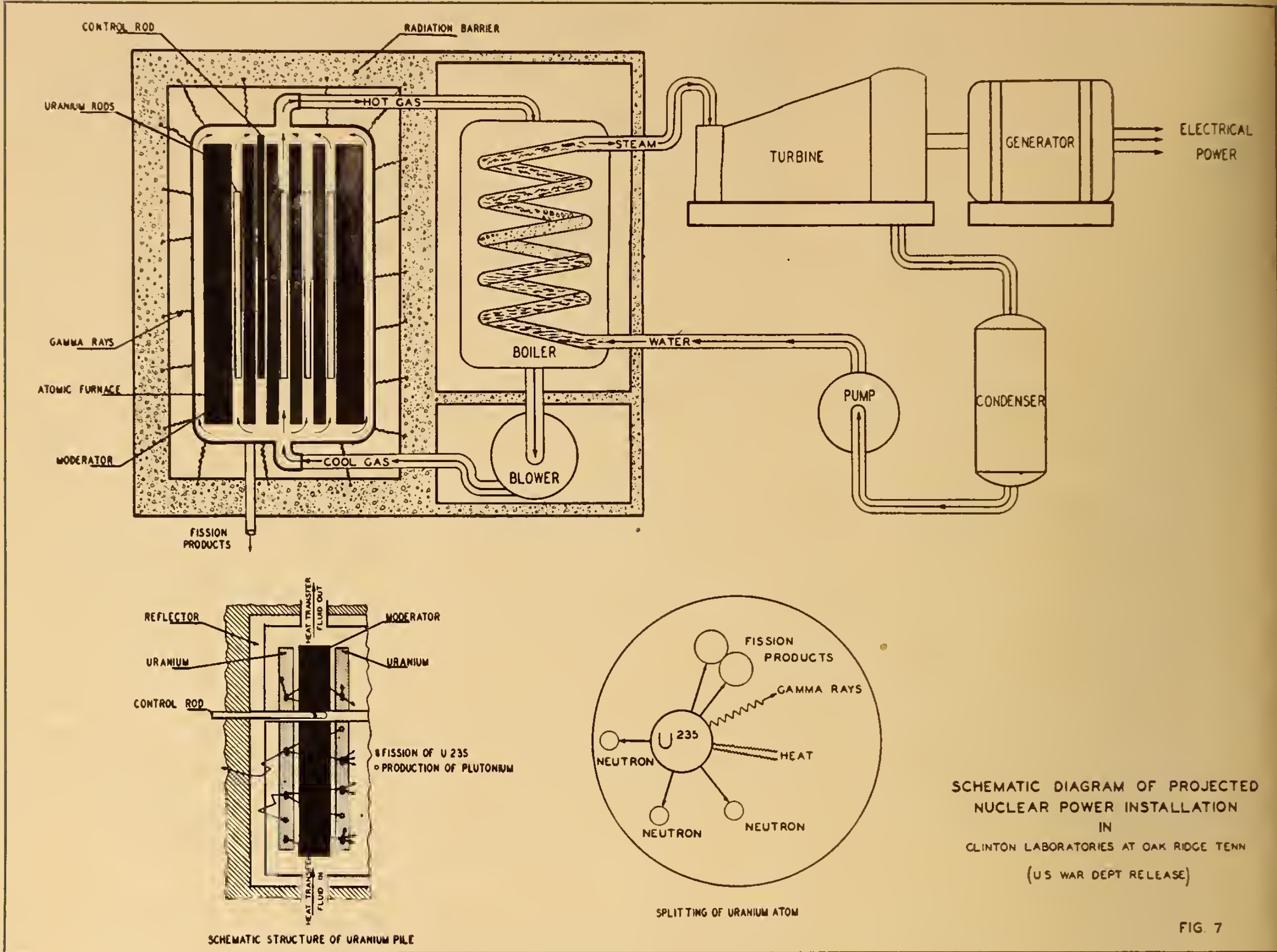


FIG. 6



SCHEMATIC DIAGRAM OF PROJECTED NUCLEAR POWER INSTALLATION IN CLINTON LABORATORIES AT OAK RIDGE TENN (U S WAR DEPT RELEASE)

FIG. 7

Table I

Nuclear Energy for Power Production

Table taken from paper by Ward F. Davidson, Research Engineer, Consolidated Edison Co. of New York Inc., presented at the Fuel Economy Conference of the World Power Conference, The Hague, 1947.

The following data marked * in the Table below has been taken from the reports submitted to the United Nations Atomic Energy Commission as " Scientific Information Transmitted to UNAEC " by Mr. Bernard M. Baruch, United States Representative. The estimates given are based on studies made by members of the Monsanto Clinton Laboratories staff, and the Monsanto Chemical Co. engineering department under the direction of Dr. C. A. Thomas, vice-president of Monsanto Chemical Co.

COMPARISON OF CAPITAL AND OPERATING COSTS OF ELECTRICITY FROM NUCLEAR POWER AND FROM COAL

Item	*Unit*	*Nuclear Power*	*Coal*
Installed plant capacity*	kw.	75,000	75,000
Construction cost, Total*	$	25,000,000	10,000,000
Cost per unit capacity	$/kw.	333	133
Annual load factor		100%	100%
Annual output	kwh.	657,000,000	657,000,000
Price of coal*	$/ton		7.00
Heat value of coal*	B.T.U./lbs.		13.500
Plant thermal efficiency			0.25
Annual charges			
Interest*	$	750,000	300,000
Fuel	$	} 4,506,000	2,301,000
Other operation	$		1,699,000
Total	$	5,256,000	4,270,000
Cost per unit of output	mills/kwh.	8.00	6.50

* Data given in report; other values are derived.
N.B. difference in cost 1.5 mills per kwh. x 657,000,000 kwh. = $990,000.
coal cost $2,301,000 ÷ 7 = 330,000 tons.
$990,000 ÷ 330,000 tons = $3.00 per ton + $7.00 = $10.00 per ton.

13,500 BTU was taken at about $3.50 per ton at the mine and about $7 per ton delivered to the furnace of a power plant in the eastern United States. The cost of producing power in this plant would be approximately 6.5 mills per kilowatt hour. Dr. Thomas concludes that equality of operating costs between coal power plants and nuclear power plants would be reached if the coal were $10.00 per ton.

Mr. Ward F. Davidson, research engineer of Consolidated Edison Co. of New York Inc., made the following comments in a paper presented at the Fuel Economy Conference, at the World Power Conference, at the Hague in 1947. After discussing the general engineering and technical problems involved in the design of a power plant using atomic energy, Mr. Davidson concluded that:

" There are so many uncertainties that it is clearly impossible at this time to make any predictions as to construction or operating costs for such power plants."

He considers it disappointing

that the report does not show separately estimated charges for depreciation, for maintenance, for labour and supervision. He also points out that the thermal efficiency for the coal plant is too low, and that in sum:

"Several of the assumptions made by Dr. Thomas are such as to make the comparison of power from nuclear energy and power from coal unduly favor the former, and that consequently in terms of the probable economic justification for nuclear energy, it means that the point of equal cost would not come with cost at $10.00 per ton ($0.37 per million BTU) but at a considerable higher cost for coal."

Mr. Walter Isard of the American University and Mr. John B. Lansing of the Massachusetts Institute of Technology, in a recent paper entitled "Comparison of power cost for atomic and conventional steam stations", took up again Dr. Thomas' estimate of the cost of nuclear energy. By assuming load factors of 80 per cent and 50 per cent respectively, instead of 100 per cent as used by Dr. Thomas, they concluded that cost of atomic power under these assumptions would be 9.4 mills per kwh. for an atomic plant operating at 80 per cent load factor and 14.5 mills for a plant operating at 50 per cent load factor. At the beginning of their paper, however, these authors warned their readers of the difficulty in making dependable estimates of the cost of atomic power:

"All existing nuclear piles have been constructed for non-power purposes. And there is great uncertainty about both capital and operating costs of the pile, chemical and metallurgical plants, and heat exchanger of the future atomic plant. Little, if any significance, therefore, should be attached to the numerical estimates of costs of atomic power used in this paper."[3]

Another point which should be noted is that Messrs. Isard and Lansing used in their calculations of the capital costs of an atomic power plant the figure of $25,000,000 adopted by Dr. Thomas. Since Dr. Thomas made this estimate, the construction cost index has

[3] Furthermore Mr. Isard stated that this paper would be revised in some important respects and that the finished paper would be published in a forthcoming issue of *Review of Economics and Statistics*.

Table II

Estimates of Atomic Power Costs

By Messrs. Isard & Lansing

Installed plant capacity	75,000 kw.	75,000 kw.
Plant factor	80%	50%
Annual output	25,600,000 kwh.	328,600,000 kwh.
Capital Costs:		
a. Pile	$12,000,000	$12,000,000
b. Chemical and Metallurgical plants	5,000,000	5,000,000
c. Steam plant	2,000,000	2,000,000
d. Power plant	6,000,000	6,000,000
Total	$25,000,000	$25,000,000
Capital costs per kw.	$333	$333
Costs of Production		
1. *Direct Costs:*		
a. Fuel	$ 50,000	$ 35,000
b. Labour and supervision	500,000	500,000
c. Maintenance	750,000	600,000
d. Supplies, chemicals and other expenses	175,000	175,000
	$1,475,000	$1,310,000
2. *Fixed Costs:*		
a. Interest 3% on the average	$ 750,000	$ 750,000
b. Depreciation and obsolescence (1) on pile 10%	1,200,000	1,200,000
(2) on chemical and metallurgical plants 6%	300,000	300,000
(3) on conventional power equipment 4%	320,000	320,000
c. Insurance, taxes and miscellaneous charges at 3.5%	875,000	875,000
Total	$3,445,000	$3,445,000
Total Costs of Production	$4,920,000	$4,755,000
Total Costs per kwh.	9.4 mills	14.5 mills

gone up over 40 per cent in the United States and the cost of skilled labour about 35 per cent. Making this correction would bring the costs of the atomic power plant to at least $35,000,000 and the cost of producing power would also be raised proportionately. Referring to the question of capital cost, Mr. David Lilienthal, chairman of the United States Atomic Energy Commission, speaking in Boston, on November 19th, 1948, explained why the development of atomic energy remains a public responsibility, and said in part:

"No private concern has yet come forward with a proposal to build a reactor at the expense of the Company. There is good reason for this. These reactors are very expensive experiments. . . . Altogether the cost of a reactor runs to something like $50,000,000. The prospect of a return is remote, and the money risk is great."

The following Table II has been taken from the paper by Messrs. Isard and Lansing.

It must be pointed out here that Dr. Thomas' estimate of 8 mills per kwh. and Messrs. Isard and Lansing of 9.4 mills to 14.5 mills per kwh. are for nuclear energy at the plant and at generator voltage. The average return of hydro-electric energy sold in the Province of Quebec is somewhat less than 4 mills per kwh. delivered to the various customers so that the cost of nuclear energy would have to come down considerably before it could compete with power from hydro-electric plants.

Another feature which is not always mentioned is the fact that if an atomic pile goes wrong, the whole mass within the concrete shield is so radio-active, that it cannot be approached for months. One of the foremost British authorities, Sir Wallace Akers, Director of Atomic Research in Great Britain, last year made the following very realistic comment on this problem:

"How many times must the initial capital equipment be multiplied to provide the continuous source of power upon which people can rely as they now rely on power stations."

Latest News in the Field of Nuclear Power Research

The United States Atomic Energy Commission has frequently been criticized for devoting most of its energy to the military aspects of atomic energy rather than towards the industrial utilization of nuclear energy. Apparently this criticism has had its effect because, at the beginning of February of this year, Commissioner Robert Bacher, a member of the AEC announced that the Commission now has a programme for tackling the three crucial questions that must be answered before any one can tell what atomic energy's real role is going to be.

The first question is that of "breeding", that is to say can a reactor be built that will produce more fissionable material than it consumes. There is only one known substance found in the earth, on which nuclear energy relies, namely the isotope 235 of uranium (U-235). It is present in uranium to the extent of one part in 140 or 0.7 per cent. There are, however, artificial fissile substances, which can be made as products of nuclear reaction induced by the release of nuclear energy. Two in particular are of interest as they have a bearing on the problem of the large scale exploitation of atomic energy. These are isotopes 239 of the new element plutonium (PU-239) and the man-made isotope 233 of uranium (U-233). Both have nuclear properties similar to U-235, and can in principle be used as active agents of a nuclear reactor.

Plutonium is automatically produced in any nuclear reactor using natural uranium (as distinct from uranium in which the 235 isotopes have been concentrated by isotope separation). U-233 is produced from thorium (TH-232) when it is introduced into a nuclear reactor.

It is not yet known whether "breeding" is feasible, that is to say whether a reactor can be built that will produce more fissionable material than it consumes. If the answer is yes, then atomic energy is a major power resource comparable to coal, good for thousands of years. If the answer is no, then uranium 235 is probably a special freak that must be rigidly conserved for military uses. A number of leading industrial firms in the United States have been retained by the A.E.C. to tackle this problem: they are E. I. Dupont de Nemours, General Electric Co., Standard Oil Development Co., Carbide & Carbon Chemicals Corp., Kellez Corp., BlawKnox Co., Monsanto Chemical Co., and Dow Chemical Co. The U.S. Atomic Energy Commission expects to have an answer by 1951 or 1952.

The second problem to be studied is to find out if atomic reactors can produce electric power on a large scale at a cost comparable to that of existing coal and hydro plants. The Atomic Commission has initiated an extensive programme in Commission owned facilities, chiefly at the Argonne Laboratory near Chicago, where a reactor known as the Zinn pile will be built to run at an extremely high temperature, 2,000 degrees F., and will be fueled by highly enriched U-235 operating with fast neutrons. This pile is expected to generate considerable power.

Another reactor will be built by General Electric at its Knolls Atomic Power Laboratory near Schenectady. This reactor will run somewhat cooler than the Zinn pile but will also take off a substantial amount of power by circulation of a liquid metal, (possibly a sodium potassium alloy), through the pile, and then through a heat exchanger. The Commission expects to know by 1957 at what cost nuclear energy can be produced.

Thirdly the Westinghouse Electric Corporation is undertaking the construction of test models of reactors for driving submarines and other naval vessels, which means that considerable power must be generated in a small space. It will use enriched U-235 for fuel and will have no chemical heating plant. The engine will be so designed that, when fission products begin to poison the reactor, the whole fuel unit can be removed and sent to a treatment plant, while a new fuel unit is inserted in the engine. Construction by Westinghouse is scheduled to start early in 1950, and by 1952 or 1953 A.E.C. may have an atomic engine for warships that will give them a range of tens of thousands of miles without refueling. This investigation has been initiated in the hope of finding out if, regardless of costs, the atomic power plants can do things which cannot be done in any other way.

Conclusions

Summing up, there is no doubt that electricity from the atom will eventually be used commercially, but it is very doubtful if atomic electricity will ever compete in cost with hydro-electricity. It must also be pointed out that the development of a practical and economical power plant would not change the present methods of transmitting and distributing electricity. It is simply a case of the nuclear power plant versus the hydraulic or fuel power plant, and the writer does not think that the hydro-electric plant will be displaced by the atomic power plant, certainly not for a number of years to come.

In concluding, it seems advisable to quote the authoritative opinion of Mr. David E. Lilienthal, chairman of the United States Atomic Energy Commission, who stated the case as follows:

"When can we expect a substantial part of this country's energy requirements — say 10 to 20 per cent—to come from atomic energy plants. Are such things right around the corner? Should the power industry slow up plans for expansion of steam generated power? Should Congress drop the St. Lawrence power project? Should investors in the power industry begin to worry about the effect of atomic energy on their holdings?

"The facts compel the conclusion of the Atomic Energy Commission that power from atomic energy is definitely not just around the corner. It will almost certainly follow the course of supplementing rather than supplanting existing, economical sources of energy supply. Our judgment is clearly that no one should delay sound and economical additions to power supply, whether by fuel generated electricity or water power."

The most recent expression of opinion concerning atomic power, appeared in the fourth semi-annual report by the United States Atomic Energy Commission, addressed to Congress:

"Even on the assumption of a most favorable and rapid technical development along these lines, a word of caution is needed as to the time scale. We do not see how it would be possible under the most favorable circumstances to have any considerable portion of the present power supply of the world replaced by nuclear fuel before the expiration of 20 years."

THE members of the Engineering Institute of Canada are proud to join their fellow Canadians in welcoming the people of Newfoundland into the Dominion. May the new status of the Ancient Colony lead to the greatest era of development and prosperity in its long history.

FROM MONTH TO MONTH

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

The Field Secretary

At the March meeting of Council held in Hamilton Vice-President R. S. Eadie announced that the long search for a Field Secretary had ended in an appointment which he was certain would meet with unanimous approval throughout the membership. The name he wished to announce was Mr. Charles E. Sisson of Toronto.

Mr. Sisson's duties begin on April 1st. Due to personal arrangements made previously he is not able to devote full time to the position until August or September, but he assumes office on a part time basis immediately.

Mr. Sisson is suited admirably to the task as he has occupied several branch and Institute offices. He is well and favourably known in Ontario and as well has numerous friends in other parts of Canada. He is familiar with Institute affairs and Institute policy having devoted much time to his duties as committee and branch chairman, councillor, and vice-president.

He was born in Dunham County, Ontario, and attended high school in Peterborough, after which he taught school for two and a half years. He left this to join the Canadian General Electric Co. in 1901 but in 1902 enrolled in engineering at the "little red school house", now the Faculty of Applied Science and Engineering at Toronto. He was graduated in 1905 with honours and the class prize. Also he was elected president of his class, a position he has maintained ever since.

He returned to the Canadian General Electric taking a particular interest in transformer and induction motor design. He was prominent in the establishment and development of the company's

C. E. Sisson, M.E.I.C.

student training courses, an interest which he maintained throughout his career with the company. In 1921 when the transformer work was transferred to Toronto, he transferred also, later becoming managing engineer of the Davenport Works. He retired from the company at the end of 1947.

Outside of his work Mr. Sisson has had several interests. For two years he was a member of the Peterborough Utilities Commission. He was chairman of the Toronto section of the American Institute of Electrical Engineers, and later vice-president for Canada. For two years he was a councillor for the electrical division of the Association of Professional Engineers of Ontario.

Outside of the activities related to his profession, he has given generously of his time to educational, Red Cross, Church and fraternal work.

During the summer Mr. Sisson plans to visit branch offices in Quebec, New Brunswick and Nova Scotia, in addition to which he will be in attendance at the Annual Meeting at Quebec from May 10th to the 14th.

The Institute is indeed fortunate to secure a member whose qualifications are so ideally suited to the duties and opportunities of this important office.

Chemistry in Canada

It is a pleasure to welcome into the Canadian field of technical periodicals, the new publication of the Chemical Institute of Canada. Starting with the April issue the Chemists will be speaking with their own voice instead of through the medium of a commercial publication. Up until the beginning of this year the publication *Canadian Chemistry and Process Industries* has been the organ of the society, and it has served the purpose well — as well as could be expected of a publication that was not fashioned solely to their needs.

It was a normal evolution that the society which was re-organized in 1945 should now require its own monthly periodical. It is perhaps unfortunate that the project had to be launched under the unfavourable publishing conditions of today, but the society's decision to go ahead is but a demonstration of the courage and farsightedness of its officers.

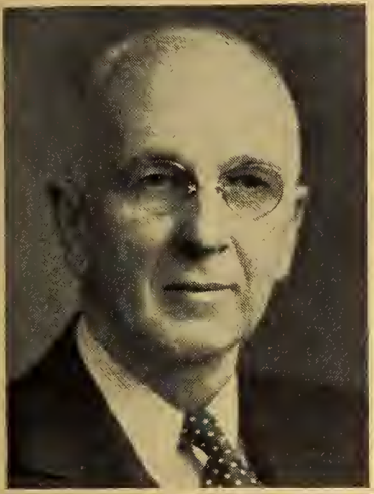
The Engineering Journal wishes its new confrere success in all its endeavours. If in any way the Engineering Institute can be of assistance in the naturally difficult days that follow the inauguration of a venture such as this, it will be a pleasure to have the opportunity to serve.

To *Chemistry in Canada* we extend our sincere good wishes and our hopes for an early realization of its programme and its purposes.

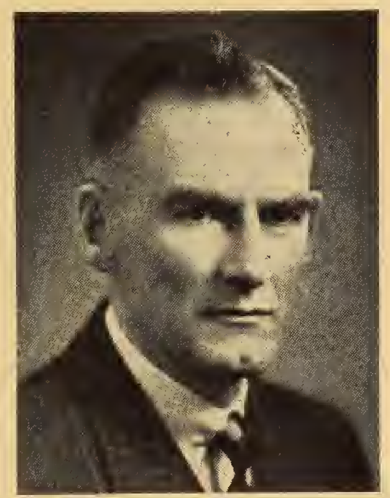
A New Dean of Engineering at Toronto

Some time ago the retirement of Dr. C. R. Young, Dean of the Faculty of Applied Science and Engineering, University of Toronto was announced by Dr. Sydney Smith, president of the university.

Dr. Young's successor has now been named. He is Kenneth F. Tupper formerly director of the engineering division of the atomic energy project at Chalk River. Mr. Tupper joined the University staff on April 1st and will succeed Dr. Young on July 1st.



C. R. Young, M.E.I.C.



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Kenneth F. Tupper, M.E.I.C.

C. R. Young was appointed Dean in 1941 after serving on the University of Toronto engineering staff for more than thirty years. He has had a distinguished career (see *The Engineering Journal March, 1942*, page 173) and has been the recipient of numerous honours and awards in recognition of his services. One of his greatest interests has been the development in engineers of " those things that represent the significant difference between a professional engineer and a technologist " to quote from his message to the members of the Institute upon his election to the presidency in 1942.

The *Journal* has published several of his addresses and writings in support of this purpose and they have invariably been noteworthy. If Dr. Young is able to turn some of his newly acquired leisure time to further writings on this subject the profession will be greatly enriched thereby.

Kenneth F. Tupper is one of Canada's leading authorities on atomic energy and jet propulsion. He received his early education in Saskatoon and Calgary and graduated with the degree of B.A.Sc. in mechanical engineering from the University of Toronto in 1929. He also holds a masters degree in aeronautical engineering from the University of Michigan.

During the war he was one of three members of a mission of the National Research Council sent to England to study the jet propulsion work of Air Commodore (now Sir Frank) Whittle. When a Canadian Crown Company, Turbo Research Limited was formed to work in the field of jet propulsion, Mr. Tupper became its chief engineer.

Turbo Research Limited was absorbed by the Avro (Canada) organization and Mr. Tupper went to the Chalk River Project where in February, 1947, he became director of the engineering division.

At 43 Mr. Tupper has accepted the responsibility for the operation of Canada's largest engineering school, which responsibility is made greater because of the high standard set by his predecessor. Mr. Tupper's record indicates that the University has made a wise choice and his age should ensure that the benefits will be available for many years. In the leisure afforded by his retirement, Dean Young may be able to exert an even wider influence in the acquirement and manifestation by engineers of " those attributes of a well-rounded professional man that lie beyond and above a mere knowledge of the techniques and procedures necessary to the attainment of the physical objectives of his work."

It appears that the benefit to the profession will be twofold.

Personality Requirements for Engineers

Three years ago the Engineers' Council for Professional Development of which the Engineering Institute is a member sponsored a study, the purpose of which was to sensitize college students as to the definite requirements of personality and character which the world wants and needs, in its leaders and its workers.

A subcommittee, chaired by Dr. Allan R. Cullimore undertook to explore the possibilities of inventorying the personality factors involved in requirements for various engineering classifications, by sending questionnaires to a pilot group of widely dispersed executives, representing a good cross section of American engineering activity.

An interim report by this subcommittee published in June 1948, reported that for general engineering, " intelligence " was ranked first as a requirement by 80 per cent of replies; and a further 18 per cent ranked intelligence in third or fourth place. Similarly " physically acceptable " was ranked by 93 per cent of replies in fifth or sixth place. " Dependability " was ranked in the first three places by 82 per cent of replies, while " organizationally acceptable " ranked in the first three places by 84 per cent of replies.

In the field of Research and Design the general pattern was largely the same. In Management and Production " intelligent " holds first place by a small margin, while other qualities increase in value. In Sales and Distribution, " intelligence " is ranked in fourth place, while " dynamic " and " physically acceptable " moved up to first and second place respectively.

The next step was to broaden the survey by tapping the opinions of two other groups: college administrators, and engineering faculties. The comparison of replies from these groups with those from the pilot group indicates that for General Engineering there are few deviations. The administrators were inclined to give equal weight to " Intelligent " and " Dependable ", in contrast to the other two groups. On the whole the picture is very much the same for all, as regards concentration of choice.

The result of a similar sampling of a cross-section of merchants, distributors, manufacturers and personnel officers, compared to the rankings in the " General " classification made by the three groups sampled at the engineering level, indicated a substantial agreement, except in the qualities of " Dynamic " and " Emotionally Acceptable ". The personnel officers distinctly reversed the relative positions previously established for these characteristics, placing the former in next to last place, just above " Physically Acceptable ", and advancing " Emotionally Acceptable " to fourth place.

Copies of the complete report may be secured through Headquarters of the Institute for 25 cents.

Correspondence

The Editor,

The November issue of the *Journal* published the ECPD " Canon of Ethics for Engineers " and solicited an expression of opinion from the membership. Engineering ethics has been the subject for study of a group of graduate students at Purdue University under the direction of Prof. R. E. Fadum. During classroom discussions, the following questions were raised which, I feel, should be clarified before the Canon of Ethics is adopted by the Institute.

(a) Engineers are frequently called upon to write letters of recommendation for former employees or students. Occasionally, the person writing the recommendation may feel that an unfavorable reply would be in the best interests of all concerned. Section 23 of the Code states, in part, " He (the Engineer) will not directly or indirectly injure the professional reputation, *prospects* or practice of another engineer." An unfavorable reply would certainly injure the prospects of the Engineer; however, I would consider it unethical not to submit a poor or negative recommendation when it is felt that the Engineer in question is absolutely unqualified or unsuited for the position for which he is applying. Because of the situation described above, a rewording of Section 23 appears to be in order.

(b) Section 15 of the Code states, " He (the Engineer) will not accept compensation, financial or otherwise, from more than one interested party *for the same service*, or for services pertaining to the same work, without the consent of all interested parties." It is common practice for consulting engineers to duplicate plans as much as possible provided, of course, that these plans are considered to be the most economical solution for their clients. Could not the words " for the same service " be interpreted as condemning this practice?

I would be interested in your views regarding the questions raised in this letter.

G. A. Leonards, M.E.I.C.,

Instructor, Soil Mechanics and Foundation Engineering, Purdue University, Lafayette, Indiana.

Second Wallberg Lecture

The Scientist and The Engineer

" The scientist and the engineer have much to contribute to progress, not only through their professional accomplishments, but also through the influence their example can exert on the attitudes of the general public. Current emphasis on research and development indicates increased public appreciation of the value and power of science, and adds up to greatly increased opportunities for scientists and engineers. But with the opportunities come new responsibilities. Has the rapid increase of public faith in science caught us unprepared to make good? If so, the pendulum may later swing the other way ".

This was the keynote of an address recently given by Dr. Karl Taylor Compton. The occasion was the presentation before the Faculty of Applied Science and Engineering of the University of Toronto, on January 11th, 1949, of the Second Wallberg Lecture, one of a series of continuing lectures for the advancement of engineering educational work, as provided for in bequests of the late Emil Wallberg, prominent Canadian engineer of Swedish birth, and bearing his name.

Following a brilliant service of fifteen years as Professor of Physics in Princeton University, culminating in the Chairmanship of the Department, Dr. Compton was appointed to the Presidency of the Massachusetts Institute of Technology in 1930. For eighteen years he filled that office with great distinction, retiring from it only a few months ago to become Chairman of the Research and Development Board of the United States Military Establishment. As member or directing head of over fifty Boards, Councils, Foundations, Commissions, Bureaux, or Committees he has made an incalculable contribution to his own country and to the whole civilized world in the furtherance of the arts of peace and the promotion of security against aggression.

What are the things, Dr. Compton asks, that people most crave and need? What can the scientist and engineer contribute toward the satisfaction of these desires? They crave peace and security; protection against the perils of nature; steady employment, more compatible working conditions, better housing, better health. The greatest ultimate challenge to mankind is the problem of maintaining our growing population in the face of rapidly depleting resources. Science and Engineering have positive contributions to make to every one of these requirements. Technological progress is the only common denominator to them all.

The author points out that "Salomon's House", the research organization visualized by Francis Bacon back in the sixteenth century in his *New Atlantis*, epitomizes the whole duty of the scientist and the engineer. For Bacon wrote that its objective was to arrive at "the knowledge of causes, the secret motions of things, and the enlarging of the bounds of human empire, to the effecting of all things possible." In conclusion he recalls the warning words of Francis Bacon: "that which man altereth not for the better, Time, the Great Innovator, altereth for the worse." The scientist and the Engineer must be creative and progressive.

Dean C. R. Young, of the University of Toronto, realizing the outstanding value and importance to the profession of the messages contained in these Wallberg lectures, has again made it possible for members of the Engineering Institute of Canada to obtain copies of another of them. Single copies will be supplied free on application to the Secretary of the Faculty of Applied Science and Engineering, Toronto University. Multiple copies will be furnished at cost.

A. B. Dove, M.E.I.C., of Montreal, a director of the **Wire Association,** advises that this world wide organization will hold its first Canadian regional meeting in Montreal, April 28-29, at the Mount Royal Hotel. Information may be obtained from Mr. Dove, at the Steel Company of Canada Limited, P.O. Box 460, Montreal.

The **Canadian Welding Bureau** announces that Harry Thomasson, M.E.I.C., of the Canadian Westinghouse Company will make a western lecture tour in the interests of the Bureau. He will spend two days in each of the cities of Winnipeg, Calgary, Edmonton and Vancouver, delivering a series of lectures to participants in the Bureau's welding course.

In addition a public lecture on the first evening of Mr. Thomasson's visit to each city will be open to all interested in arc welding in any of its branches or applications.

Mr. Thomasson's itinerary is planned as follows: Winnipeg May 2 and 3; Calgary, May 5 and 6; Edmonton, May 9 and 10; Vancouver, May 12 and 13.

The office of the Bureau is at 22 College Street, Toronto, Ont.

News of Other Societies

The **Canadian Electrical Association's** 59th Annual Convention will be held at the Banff Springs Hotel, Alberta, on June 28, 29 and 30, 1948.

B. C. Fairchild, managing director of C.E.A., is in charge of arrangements. His office is at Room 704 Tramways Building, Montreal 1, Que.

The Society of Automotive Engineers has scheduled for June 5-10 the summer meeting at French Lick Springs Hotel, French Lick, Indiana.

Inquiries should be addressed to the S.A.E., at 29 West 39 St., New York 18, N.Y.

A cordial invitation from the **American Society for Engineering Education** is extended to all those interested in Engineering Education to attend the 57th Annual Meeting (June 20 to June 24) to be held at Rensselaer Polytechnic Institute located at Troy, New York.

The programme at this meeting will consist of four general sessions to hear and to discuss papers of general interest together with some sixty functional conferences to discuss a variety of educational problems in such fields as, research mathematics, mechanics, architectural engineering, drawing, mineral engineering, industrial engineering, chemical engineering, electrical engineering, aeronautical engineering, physics, etc.

Reservations for registration, quarters and meals may be made by writing to Professor A. Allan K. Booth, Department of Mechanics, Rensselaer Polytechnic Institute, Troy, New York.

The **Canadian International Trade Fair** will take place from May 30 to June 10, 1949, at the Exhibition Grounds in Toronto, Ont.

The 1949 annual meeting of the **Canadian Institute of Mining and Metallurgy** will be held in Montreal, April 25 to 28 at the Windsor Hotel.

The Montreal office of C.I.M.M. is at 811 Drummond Bldg.

The **Chemical Institute of Canada** reminds engineers of the annual chemical conference in Halifax, May 30 to June 1, 1949.

Registration forms are available from C.I.C. head office, 18 Rideau St., Ottawa.

The Canadian regional conference of the **Illuminating Engineering Society** will take place April 28-29, in Toronto.

F. P. Labey of Northern Electric Co. Ltd., 1620 Notre Dame St. West, Montreal, is secretary of the Montreal Section of the Society.

The Montreal regional conference of the **American Institute of Chemical Engineers,** September 7, 8 and 9, 1949, will devote two days to technical papers. Plant visits to several industries at Shawinigan Falls Que., have also been arranged.

The local committee on arrangements is headed by Dr. H. R. L. Streight, P.O. Box 10, Montreal.

Engineers are reminded that details of the 1949 spring meeting of the **American Society of Mechanical Engineers,** at New London, Conn., May 2-4, are available from the Society, 29 West 39th St., New York, 18, N.Y.

The **American Water Works Association,** 500 Fifth Avenue, New York, 18, N.Y., has mailed advance programmes for the 69th Annual Conference which is to be held May 30 to June 3, at the Stevens Hotel in Chicago, Ill.

The 1949 convention of the Canadian Section of **American Water Works Association** is taking place April 25-27 at the Chateau Frontenac in Quebec City.

Personals

Notes of the Personal Activities of Members of the Institute

Dr. Arthur Surveyer, M.E.I.C., of Montreal, general consulting engineer, has been named a director of Credit Foncier Franco-Canadien Ltee. Dr. Surveyer is also a director of The Shawinigan Water and Power Company and of the Holland-Canada Mortgage Company.

He is a past-president of the Institute, a member of the National Research Council, and is active in various Canadian and American professional and business organizations.

Dr. J. B. Chollies, M.E.I.C., has been elected a director of The Shawinigan Water and Power Co., Montreal.

Dr. Challies, vice-president and executive engineer of the company, is also vice-president, director and secretary of St. Maurice Power Corp., and a director of Brown Co. and of Brown Corp., The Shawinigan Engineering Co. Ltd., Quebec Power Co., Canadian Light and Power Co., and Saguenay Power Co. Ltd.

W. K. Dow, M.E.I.C., and **A. B. Rogers,** M.E.I.C., announce their association as consulting electrical engineers, providing a complete consulting service covering industrial and municipal electric power and lighting systems.

Mr. Rogers, upon leaving McGill University in 1915, joined the Engineering Department of Shawinigan Water and Power Company. For the past more than 25 years he has been in charge of the department of the Shawinigan Engineering Company responsible for the design and construction of primary and terminal substations on the Shawinigan system. He was also responsible for the design and installation of a large number of electric boiler plants.

Mr. Rogers has been intimately associated with the rapid expansion of the Shawinigan Company, recently retiring as senior electrical engineer. He is a member of the Corporation of Professional Engineers of Quebec, The Canadian Standards Association and the Canadian Electrical Association. He is also a life member of the Montreal Amateur Athletic Association.

Mr. Dow graduated in electrical engineering from the University of Toronto in 1937, when he began his engineering career with the Aluminum Company of Canada at Arvida.

From then until 1943 he was engaged in many phases of the company's power expansion programme involving facilities for aluminum ore and reduction plants at Arvida, Shawinigan Falls, La-tuque, and Beauharnois, Quebec, as well as fabrication plants at Toronto and Kingston, Ontario. During this time he obtained leave-of-absence from the Aluminum Company to pursue post-graduate studies at the University of London, England.

In 1943, Mr. Dow transferred to Canadian Comstock Company where he was responsible for the design and supervision of power installation for a number of large industries, particularly those of aluminum and pulp and paper. He is now engaged in projects for the pulp and paper and mining industries. He is a member of the Corporation of Professional Engineers of Quebec, The Association of Professional Engineers of Ontario, and the American Institute of Electrical Engineers.

W. L. Bird, M.E.I.C., retired on March 31 after 43 years with the Kaministiquia Power Company, Fort William, Ont. He has been vice-president and general manager of the Power Company, which was recently purchased by the Ontario Hydro Electric Commission to be absorbed into the Hydro's Thunder Bay system.

The Company, with headquarters in Fort William and plant at Kakabeca Falls has operated successfully since 1906. On its first local industrial contract for electrical power, with the Fort William Times-Journal, dated June, 1906, one of the signators was Mr. Bird, who has been manager since its inauguration.

J. B. Challies, M.E.I.C.

Lt.-Col. K. R. Swinton, M.E.I.C., former honorary secretary, was elected president of the Montreal branch, United Nations Association.

C. V. Antenbring, M.E.I.C., chairman of the Winnipeg Branch of the Institute this year, is president and manager of Cowin & Co. Ltd., Winnipeg.

Mr. Antenbring graduated from the University of Manitoba in 1926. He joined Cowin & Co. in 1927 as designer of reinforced concrete, after spending some months with Kelker & DeLeew, municipal engineers, Chicago, Ill.

W. Romsoy, M.E.I.C., has been elected chairman of the newly formed Central British Columbia Branch of the Institute. He is a former district engineer of the Department of Public Works of British Columbia, having been stationed in various parts of the Province before his retirement recently.

Prof. A. H. Douglos, M.E.I.C., the new chairman of the Saskatchewan Branch of the Institute, is associate professor in the engineering department of the University of Saskatchewan, Saskatoon.

Prof. Douglas is a graduate of that University, and was with the department of Highways of Saskatchewan as assistant bridge engineer until he entered the R.C.A.F. in 1941. He served until 1945, attaining the rank of wing commander. He returned to the Department of Highways and Transportation as inspection engineer, but joined the faculty of the University in 1947.

A. M. Thompson, M.E.I.C., was recently elected 1949 chairman of the Electrical Section of the Winnipeg Branch of the Institute. Mr. Thompson is apparatus sales engineer with the Canadian General Electric Company in Winnipeg.

J. W. Kerr, M.E.I.C., has been named manager of the newly formed Central Station and Transportation Sales Division of Canadian Westinghouse Company Limited, Hamilton, Ont.

Mr. Kerr was formerly manager of central station sales and his responsibilities will continue to cover all central station apparatus, and in addition will include steam and traction apparatus.

J. F. Lester, M.E.I.C., is now with the Highways Branch of the Department of Public Works of the Province of Alberta, at Edmonton.

Mr. Lester has recently returned from England, where he was engineer agent with Sir Alfred McAlpine Ltd., civil engineering contractor at Wolverhampton.

W. F. McMullen, M.E.I.C., has been named manager of the Technical Personnel Division of Canadian General Electric Company.

In addition to assisting the director of personnel administration in all matters relating to the technical personnel of the Company, Mr. McMullen is responsible for recruiting engineering graduates for C.G.E.'s well-known "Test" Course, and assisting in their final placement within C.G.E. or industry generally.

J. D. Duncon, M.E.I.C., has been named manager of the Induction Motor Section of Canadian General Electric Co. Ltd., with responsibility for the company's wide range of induction motors over 1/3-h.p. in rating.

Per Hall, M.E.I.C.

A graduate of the University of British Columbia, on completion of C.G.E.'s "Test" Training he held a number of appointments in the company's apparatus organization. During the war, he rose to the rank of major in overseas service with the Royal Canadian Corps of Signals, and received the M.B.E.

Lieut.-Col. R. J. Carson, M.E.I.C., has been posted to National Defence Headquarters in Ottawa, where he is G.S.O. I to the chief engineer, Canadian Army. He was formerly command engineer officer, Eastern Command, Halifax.

Colonel Carson is a graduate of Royal Military College, 1936, and of Queen's University, Kingston, 1937.

J. M. Taylor, M.E.I.C., has announced that he will retire as city electrical engineer for Saskatoon, Sask., at the end of the year 1949.

Mr. Taylor has been with the City's engineering staff for 37 years. He was educated in Scotland, and he worked in Dundee, from 1909 to 1912 with Maxwell's Ltd., as outside foreman in charge of construction and maintenance of electric light and power installations. In Canada he was employed by the city of Saskatoon power plant, receiving successively appointments as chief electrician, assistant city electrical engineer, and acting city electrical engineer. He received his appointment as city electrical engineer in 1933.

W. A. Friebel, M.E.I.C., presently assistant electrical engineer for the city of Saskatoon, Sask., will become city electrical engineer at the end of the year 1949, on the retirement of J. M. Taylor, M.E.I.C.

Mr. Friebel is an electrical engineering graduate of University of Manitoba, class of 1933. He joined the Saskatchewan Power Commission in 1936, and was successively a relieving operator, a district operator and a district superintendent. He worked also during this time as a laboratory instructor in electrical engineering at University of Saskatchewan.

P. G. W. Walker, M.E.I.C., is with the Spruce Falls Power and Paper Co. Ltd., at Kapuskasing, Ont.

He had been municipal engineer for the City of St. Thomas, Ont., since 1947. He was with the R.A.F. as a pilot and instructor from 1941 to 1946, after which he returned to Sir Alexander Gibb & Partners in England, with whom he was associated before going into the R.A.F. Mr. Walker graduated from Cambridge University, England, in 1941.

Per Holl, M.E.I.C., has been appointed assistant chief engineer of the Foundation Company of Canada Limited, at Montreal.

Mr. Hall joined the Company in 1946 as a designing engineer. He had previously been with Aluminum Company of Canada Limited from 1940, working in Montreal, Newfoundland, the Virgin Islands, and in British Guiana.

Mr. Hall graduated in 1929 from the Royal Technical College in Copenhagen, Denmark, receiving the degree of B.Sc. in civil engineering. He worked in Europe until 1939.

G. G. Leroux, M.E.I.C., has been named supervisor, engineering design, for Foundation Company of Canada Limited, at Montreal.

Mr. Leroux is a graduate of McGill University, receiving the degree of bachelor of engineering in 1940. He was with the R.C.A.F. from 1940 to 1945, and he joined Foundation Company in 1945.

J. M. Thomas, M.E.I.C., has been named mechanical engineer for Foundation Company of Canada Limited, at Montreal. Mr. Thomas is a graduate of University of New Brunswick, with degrees in civil and electrical engineering received in 1932 and 1933. He joined Foundation Company in Montreal in 1940, coming from the Highway Department of New Brunswick. He was with Foundation Maritime Ltd., in 1942 to 1945, with the position of planning engineer and later production engineer. He returned to Foundation Company of Canada in Montreal as designing engineer in 1945.

J. D. McPherson, M.E.I.C., is the 1949 chairman of the Junior Section of the Montreal Branch of the Institute. He is assistant chief engineer of Highway Paving Co. Ltd., Montreal. He graduated from University of Alberta in 1943 with the degree of B.Sc. in civil engineering.

Thomas A. Monti, M.E.I.C., has been appointed district engineer in Montreal for the Canadian Institute of Steel Construction.

He graduated in 1941 from Ecole Polytechnique, Montreal, and he joined the staff of Dominion Bridge Company. In 1943 he became assistant manager of Colonial Industries Ltd., in Montreal. From 1944 to 1947, Mr. Monti worked as a consulting engineer to small machinery manufacturers, and upon receiving from the University of Montreal in 1947 the degree of Doctor of Science in physics of metals, he joined the National Research Council as Montreal regional representative. During the last six years, he has also been attached to the Ecole Polytechnique as part-time assistant professor in strength of materials.

F. R. Thompson, Jr.E.I.C., has accepted employment as a design engineer with Cockshutt Plow Co. Ltd., Brantford, Ont. He was previously a detail engineer with Mathews Conveyer Co. Ltd., Port Hope, Ont. He graduated from University of Saskatchewan in 1946, with the degree of B.Sc. in mechanical engineering.

W. E. Boyle, Jr.E.I.C., is joining the refrigeration engineering staff of Arnett Company Limited, Winnipeg, Man. He is a graduate mechanical engineer from the University of Saskatchewan, and has been on the instruction and research staff of that university prior to joining the Arnett organization.

A. R. Hailey, Jr.E.I.C., has been elected chairman of the Peterborough Branch of the Institute.

Mr. Hailey is assistant D.C. design engineer, Canadian General Electric Co. Ltd., Peterborough. He has been with the C.G.E. since his graduation in 1941 from the University of British Columbia with the degree of B.A.Sc.

A. R. Hailey, Jr.E.I.C.

Leo Schorry, Jr.E.I.C., has returned recently from Philadelphia where he attended a course in telemetering equipment and power recorders at the plant of Leeds & Northrup Ltd. Mr. Scharry is a sales engineer with Sangamo-Wagner Company, in Montreal.

James F. McKay, Jr.E.I.C., is employed by the Dow Chemical Company of Canada in Sarnia, Ont., as a process engineer. Mr. McKay recently returned from Massachusetts Institute of Technology where he followed a post graduate course in chemical engineering. A chemical engineering graduate of University of Saskatchewan class of 1944, he was for a time in the R.C.N.V.R. and was in 1946 in the production department of Naugaturck Chemicals, Elmira, Ont.

J. B. Goodfellow, Jr.E.I.C., has rejoined the Canadian Johns-Manville Company Limited, in Toronto, Ontario, as technical assistant to the Transite Pipe Section. He was previously a section leader with Stadler, Hurter and Company, consulting engineers in Montreal.

George Wood, S.E.I.C., has been elected president of the Engineering Society of the University of Saskatchewan for the 1949-50 academic year. Mr. Wood is a third year student in civil engineering and has had several executive positions in the society in the past. The retiring president is **Ston Rokosh,** S.E.I.C.

John Edwin Armstrong

C.E., M.E.I.C., C.P.E.Q.

President

OF

The Engineering Institute of Canada

Chief Engineer,
CANADIAN PACIFIC RAILWAY

In these days when there is so much talk about Canadian engineers going to the United States it is a pleasure to dwell on a case where an American has come to Canada and taken an important part in building this country.

The president-elect of the Institute, John E. Armstrong, was born in Peoria, Ill. He graduated from Bradley Polytechnic Institute in 1905 and from Cornell University in 1908 with the degree of civil engineer.

From the beginning he has been associated with railways, starting at an early age in 1901. His earliest experience was with the Toledo, Peoria and Western Railway but subsequently (1908-12) he moved to the Pennsylvania Lines West of Pittsburgh. In 1912 he came to Canada with the Canadian Pacific Railway at Montreal as assistant engineer (1912-28) becoming a Canadian citizen in 1921. In 1928 he was appointed assistant chief engineer and in 1939 became chief engineer, the position he still occupies.

In spite of the heavy duties of his professional position he has found time to assist in the activities of various societies. There are three organizations to which he has made special contributions; the American Railway Engineering Association (A.R.E.A.) the Canadian Standards Association (C.S.A.) and the Engineering Institute of Canada. In the A.R.E.A., he has been a director, chairman of standing and special committees, a vice-president, and president in 1934-35. In the C.S.A. he was appointed to the main committee in 1941, and to the executive committee in 1945. He still occupies both offices. In 1940 he was president of the Canadian Railway Club. In the Engineering Institute he has been a member since 1917. He was on the finance committee from 1939 to 1947 and was vice-president of the Institute for 1945-46. He has been an active member of the Kiwanis Club of Montreal for many years.

Perhaps his most noteworthy work for the Institute was his chairmanship of the special committee on the Engineering Features of Civil Defense in 1942. Working closely with Prof. Fred Webster, (subsequently HON. M.E.I.C.) who, as Great Britain's expert on the effects of bombing, visited Canada for several months in 1942, his committee organized groups across Canada, and assembled a great volume of information which would have been vital had this country been bombed. Under his guidance the Institute arranged for a three day "secret" convention at Toronto at which Prof. Webster provided information to 150 engineers from all parts of Canada. The proceedings were published subsequently and constituted Canada's text book on that subject. Mr. Armstrong's leadership in that urgent project indicates his splendid qualifications for the high office of President of the Engineering Institute of Canada.

Newly Elected Officers of the Institute

W. J. W. Reid, M.E.I.C., the newly-elected vice-president of the Institute, for the Province of Ontario, is president of Otis-Fensom Elevator Company Limited, Hamilton, Ontario.

Mr. Reid was born in Oak River, Manitoba. After primary education in the West, he enlisted in the Royal Canadian Engineers and served overseas in World War I. On his return to Canada he studied for matriculation at the University of Manitoba, and subsequently enrolled at University of Toronto, in electrical engineering and graduated in 1924.

In 1921 he joined the Otis-Fensom Elevator Company Ltd. as a student engineer during vacations. In 1924 he completed a specialized training course with the parent Company in U.S.A. and returned to Canada in charge of electrical manufacturing and control. Subsequently, he acted as field engineer on elevator construction and service until 1926, when he became assistant construction manager. In 1927 he was appointed construction manager and in 1930 his duties were enlarged to embrace supervision of all engineering activities of the Company. In 1933 he became works manager and occupied this position at the outbreak of War in 1939.

W. J. W. Reid, M.E.I.C.

In 1941 Mr. Reid was appointed manager of munitions in charge of all Otis-Fensom war production with particular reference to the Ordnance Division, a large-scale high-priority Bofors gun project erected and operated for the Canadian Government. This undertaking, which produced thousands of complete Bofors equipments in addition to a large volume of other war materials, was built up in the course of two years from a small nucleus of technical personnel to a peak employment of approximately 5,000 persons. Mr. Reid was also responsible for the no less exacting duties of disbanding and terminating this project when its wartime purpose had been served. In the post-war re-establishment and expansion of the Company's peacetime activities, Mr. Reid's responsibilities were extended to cover all phases of Company activity throughout the Dominion, in recognition of which he was named vice-president in 1946. In July 1948 he was elected to the presidency of the Company.

Mr. Reid is active in professional, academic, and business associations. His offices and membership in such organizations include: president, Association of Professional Engineers of the Province of Ontario; and member of the Executive Committee, Canadian Manufacturers' Association, Hamilton-Brantford Branch. As a member of the Canadian Standards Association, Mr. Reid took a leading part in the framing and promotion of a Standard Elevator Safety Code for Canada. He has been active, also, in affairs of the E.I.C., which he joined in 1920 as a Student. He transferred to Associate Member in 1929 and to Member in 1940.

Richard E. Heartz, M.E.I.C., has been elected vice president of the Institute for the Province of Quebec.

Mr. Heartz, who is vice president and chief engineer of The Shawinigan Engineering Company, Limited, is a native of Prince Edward Island. Following graduation from McGill University in 1917 he enlisted with the Royal Flying Corps and received his commission with the Royal Air Force the following year.

In 1920 he began his long association with The Shawinigan Engineering Company. As resident engineer on power development at Shawinigan Falls, La Gabelle, St. Narcisse and Paugan Falls, he gained engineering and construction experience, subsequently being transferred to the Head Office in Montreal. In 1935 he was appointed assistant chief engineer and since then has been intimately associated with all phases of the numerous diversified projects of the company. Many innovations in methods and equipment, which have led to increased economies, have been initiated by him.

In 1941, during the recent war, he was loaned by the Shawinigan Company to Wartime Merchant Shipping Limited where he acted in the capacity of general manager until 1942. This Dominion-wide organization directed and co-ordinated the efforts of fourteen shipyards and their associated suppliers in carrying out the Canadian cargo vessel programme which employed at the peak 75,000 men and produced over 4,-000 000 tons of shipping.

Portrait by Nakash

R. E. Heartz, M.E.I.C.

In January, 1947, Mr. Heartz was appointed vice-president and chief engineer and was made a director of the Shawinigan Engineering Company.

Active in the affairs of the Engineering Institute for some years, Mr. Heartz was chairman of the Montreal Branch in 1941; member of council 1942-43-44; treasurer in 1948. He joined the Institute in 1917 as a Student, transferring to Associate Member in 1926, to Member in 1933. Other professional affiliations include The Corporation of Professional Engineers of Quebec, the Canadian Electrical Association, and the American Society of Civil Engineers.

H. N. Macpherson, M.E.I.C.

H. Nalan Macphersan, M.E.I.C., has been elected vice president of the Institute to represent the Western Provinces.

Mr. Macpherson, who was born at Carleton Place, Ont., is a graduate in civil engineering of University of Toronto, class of 1914, with a degree of B.A.Sc. He worked on shell inspection for the Imperial Ministry of Munitions during World War I, at Moose Jaw, Edmonton and Montreal. He later joined O'Connor Bros. Ltd., as engineer, on the Company's road building contracts in Montreal and Richmond, Que., and from 1921 to 1923 he conducted a contracting business, building bridges in Saskatchewan.

He established Regina Creosoted Products Ltd., in 1926, and since that time has been identified with the timber preservation industry. He was for several years with the Alberta Wood Preserving Co. Ltd., and the Canada Creosoting Company Ltd., at Calgary, as assistant to the vice-president, western region. In 1932 he established the Permanent Timber Products Limited at Vancouver, and continues as president of this company. His specialized field in engineering is the design and standardization of preserved timber units for construction of drainage structures.

In Regina, Calgary and Vancouver he has served on executives and committees in service club, community organization, and Board of Trade. During the last war he was a director of the Greater Vancouver Welfare Federation and Community Chest and on the executive of the Co-ordinating Council. For the Department of Labour he filled the position of regional director of the Wartime Bureau of Technical Personnel. Advisory to the construction controller, he was one of a committee of three on British Columbia licenses and priorities throughout the war.

He has been prominently identified with many engineering organizations, particularly in the Canadian West. He joined the Institute in 1917 as an Associate Member, transferring to member in 1936. He has been active on the executives of the Saskatchewan, Calgary, and Vancouver Branches, and was councillor for the Vancouver Branch in 1941.

E. C. O'Leary, M.E.I.C.

E. C. O'Leary, M.E.I.C., has been elected to represent the Halifax Branch on the Council of the Institute.

Mr. O'Leary was born in Nova Scotia and was educated at St. Mary's College, Halifax, and Nova Scotia Technical College. He obtained his degree in civil engineering from the latter in 1936.

After early experience on building construction he turned to highway-work and general construction. In his present positions as vice-president and general manager of the McDonald Construction Company, Limited (Halifax) and holding corresponding positions in the Nova Scotia Construction Company, Limited, he is now engaged in all types of construction.

Shortly after graduation he was construction superintendent with the Standard Paving Maritime Limited. As such he was in charge of various highway projects throughout the Maritimes; the construction of the Sydney-Reserve Airport; and various water, sewer and street developments. Notable amongst these was the Big Indian Lake Development, designed and executed to supply the war-swollen population and the Military and Naval installations of Halifax with water. The ground work—streets, sewer and water—for practically all Maritime Housing projects throughout Nova Scotia was carried out under his supervision.

On the formation of the Halifax Public Service Commission in 1944 he joined that organization as operations engineer. As such he was responsible for the construction, maintenance and repairs of the public water system in and serving the City of Halifax. In 1946 Mr. O'Leary took an active part in the reorganization and affiliation of the firms with which he is now associated; and has occupied his present positions since that date.

L. O. Cass, M.E.I.C.

Mr. O'Leary is the vice-president of the Halifax Construction Association. He has been active in his support of the Halifax Branch of the Institute, being elected its chairman in 1947. He joined the Institute in 1941 as a member.

L. O. Cass, M.E.I.C., has been elected Councillor of the Institute representing the Saint John Branch.

Born in Springhill, N.B., he received a B.Sc. degree in civil engineering from the University of New Brunswick in 1939 and entered the Department of Highways of New Brunswick as office engineer and instrumentman.

The same year he transferred to the New Brunswick Hydro Commission as chief of party on transmission line location. He went to Montreal, where he was employed by T. Pringle & Son, consulting engineers, as draughtsman and field engineer, and later to the Foundation Company of Canada as assistant to the group superintendent of construction at St. Paul l'Ermite, Que. Transferred to Shipshaw, Que., by the company, he was area engineer there in 1941 and 1942, when he joined E. G. M. Cape & Co. of Montreal as field engineer on the construction of the naval ordnance depot at Dartmouth, N.S.

Mr. Cass has been with the National Harbours Board at Saint John, N.B., since 1944 when he became assistant engineer.

Mr. Cass was chairman of the Saint John Branch in 1946. He joined the Institute in 1939 as a Student, transferring to Member in 1944.

G. T. Malby, M.E.I.C., has been elected Councillor of the Institute representing the Saguenay Branch.

G. T. Malby, M.E.I.C.

Mr. Malby was born at Winnipeg, Man., and educated at St. John's Technical High School, Man. He graduated with the degree of B.Sc. in civil engineering from the University of Manitoba in 1935. Upon graduation he was employed by the Manitoba Government Highway Department as field engineer. In 1936 he was engaged on aerial mapping for the topographical and Aerial Surveys Branch, Dominion Department of the Interior, Ottawa. Joining the engineering staff of Saguenay Power Company, Arvida, Que., he worked on design, construction and survey work in 1937. He transferred to the Aluminum Company of Canada, Ltd., in 1939 as assistant resident engineer on construction. In 1942 he became resident engineer for the same Company in charge of construction of plants at Shawinigan Falls and La Tuque, Que. A year later he joined the operating staff of the La Tuque Works as mechanical superintendent and in 1944 was transferred to Alcan's Arvida Works as assistant mechanical superintendent in charge of construction and plant maintenance. In 1949 he became construction engineer and inspector of buildings and structures for the Aluminum Company of Canada, Limited, there.

Mr. Malby is a member of the Cor-

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F. W. Bradshaw, M.E.I.C.

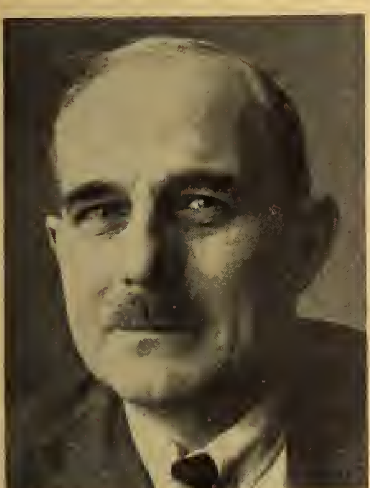
poration of Professional Engineers of Quebec. He joined the Institute as a Junior in 1938, transferring to member in 1947.

F. W. Bradshaw, M.E.I.C., has been elected Councillor of the Institute representing the Saint Maurice Valley Branch.

Mr. Bradshaw is chief engineer of the Consolidated Paper Corporation Limited, Grand'Mère, Que. He is from Surrey, England, a graduate of Wellington College, Berks, England, class of 1918. He attended McGill University in Montreal, graduating in 1925 with the degree of B.Sc. with honours in Chemical Engineering.

He had worked on vacations for Price Brothers, at Kenogami, Que., and on graduation he went to the Riverbend mill of the Company in Quebec. He was transferred later that year by the Company to Quebec City, where he was engineering assistant to the research engineer. He spent two years as assistant to the mechanical superintendent of Price Bros. Riverbend mill, and he went in 1930 to the company's specialty mill at Jonquiere, Que., where he was engineer in charge of control and engineering design.

From 1932 to 1934 he held various temporary positions including that of engineer for Carlton Mills Ltd., woollen manufacturers; and during this time he was with G. D. Peters & Co., welding engineers; and with Beardmore Leathers Limited, tannery.



R. N. Coke, M.E.I.C.

It was in 1934 that Mr. Bradshaw joined Consolidated Paper Corp. Ltd., serving first at Three Rivers, Que., as development engineer in the research department. He was named assistant to the chief engineer in 1937, and was transferred to Grand'Mère, Que. He became assistant chief engineer in 1941, chief engineer in 1943.

Mr. Bradshaw joined the Institute in 1920 as a Student, transferring to Junior in 1925, to Associate Member in 1929, to Member in 1940. He is a member of the Technical Section of the Canadian Pulp & Paper Association; and of the Technical Section of the American Pulp & Paper Industry.

E. B. Jubien, M.E.I.C., has been elected as one of the new Councillors of the Institute representing the Montreal Branch.

He was born in Sydney, N.S., educated at Mount Allison University and McGill University, graduating from the latter in 1926 in electrical engineering. He joined General Electric Company at Lynn, Mass., where he took the student test course. On returning to Canada in 1927 he was associated with Ryan & Coombe in Montreal for a period of 6 months. Subsequently in 1928 he was employed by Canadian Industries Limited, engineering department. During the period 1928-1940 he carried out engineering work at the various C.I.L. plants throughout Canada. In 1940 he was transferred to General Chemical Division of C.I.L. as assistant production manager, and in 1942 was made acting production manager. He joined Dominion Textile Co. Ltd., engineering department in 1946.

He is a member or the American Institute of Chemical Engineers and of the Corporation of Professional Engineers of Quebec. He is also a member of the Canadian Management Council and a member of the Municipal Council in the Town of Mount Royal.

He joined the Institute as a Student in 1922, became an Associate Member in 1935 and a Member in 1940. He has been a member of the Montreal Branch entertainment committee, and chairman of the papers and meetings committee in 1945, and a member of the executive committee in 1946-1947.

R. N. Coke, M.E.I.C., has been elected Councillor of the Institute representing the Montreal Branch.

He is a chief engineer, Operation Division, Quebec Hydro Electric Commission, Montreal. He was born in Jamaica, B.W.I., and graduated from McGill University with a degree of B.Sc. in electrical engineering in 1914. He joined the staff of the Northern Ontario Light and Power Company on graduation, but enlisted with the Canadian Army in 1914 and served overseas until 1919. On return to Canada, he joined the engineering staff of the Saskatchewan Provincial Telephone Company in Regina. In 1920 he joined the Bell Telephone Company in Toronto as assistant traffic engineer. In 1921 he worked with the Canadian Westinghouse Company in Hamilton, Ont., as erecting engineer. He became associated the next year with the Winnipeg Electric Company as assistant electrical engineer and later transferred to the Northern Western Power Co., as electrical engineer. In 1929 he joined the staff of the Montreal Light, Heat & Power Cons. as assistant general superintendent M.L.H. & P. Cons. and later of Hydro-Quebec.

E. B. Jubien, M.E.I.C.

Mr. Coke who has been active in Montreal Branch affairs, is a past chairman and a member of various committees. He joined the Institute in 1917 as a Junior, transferring to Associate Member in 1923, and to Member in 1939.

R. D. Bennett, M.E.I.C., has been elected to represent the Kingston Branch on the Council of the Institute.

He is a native of Montreal and attended McGill University, where he obtained B.Eng. and M.Sc. degrees in 1932 and 1933 respectively, and having served as demonstrator in the department of chemical engineering for three years, received his Ph.D. in 1935.

From 1935-1937 he was associated with the Canadian Industrial Alcohol Co. Ltd. and with J. T. MacDonald and Co. Ltd., joining Canadian Industries Limited in 1938. With that firm he served in various research and production capacities at Beloeil and Shawinigan Falls, Quebec, and in 1941 was transferred to C-I-L's Nylon Division in Montreal. In 1942, coinciding with the opening of the Kingston nylon plant, he was moved to Kingston, Ontario, where, having held Nylon Division technical and production posts, he is now in charge of nylon technical service.

Mr. Bennett is a past chairman of the Branch. He joined the Institute as a Student in 1930, transferring to Associate Member in 1938, and to Member in 1940.

J. L. Shearer, M.E.I.C., has been elected Councillor of the Institute representing the Ottawa Branch.

He is engineer to the commission, Ottawa Suburban Roads Commission. He is a native of Ottawa and a graduate of Queen's University, Kingston, Ont. From 1928 until 1933 he held various positions in Western Canada and on the Pacific coast in connection with municipal engineering construction work. In 1933 he returned to Ottawa and was for two years in charge of construction of large relief sewers being built by the City of Ottawa engineering department. Following this he was em-

R. D. Bennett, M.E.I.C.

J. L. Shearer, M.E.I.C.

V. A. McKillop, M.E.I.C.

W. H. Small, M.E.I.C. (Fryer)

ployed by N. B. MacRostie, M.E.I.C., civil engineer of Ottawa, in drawing up reports on flood conditions in southern Ontario. After short intervals with Donald-Hunt Limited, Montreal, and the Aluminum Company of Canada Limited, Arvida, Que., he was for two years on the staff of the Ottawa Division of the Ontario Department of Highways. He then was employed by the assessment department of the City of Ottawa, until his appointment to his present position in 1945.

Mr. Shearer is immediate past chairman of the Ottawa Branch. He became a Student member of the Institute in 1928, an Associate Member in 1936, a Member in 1940.

V. A. McKillop, M.E.I.C., has been re-elected Councillor of the Institute representing the London Branch. Born at West Lorne, Ont., he graduated from the University of Toronto with a B.A.Sc. degree in 1924. On graduation Mr. McKillop joined the staff of the Public Utilities Commission at London, Ont., as assistant engineer and two years later was promoted to engineer. He is at present assistant manager of the Commission.

Mr. McKillop joined the Institute as a Junior in 1926, transferring to Associate Member in 1927. He became a Member in 1940.

D. G. Geiger, M.E.I.C., has been elected Councillor of the Institute to represent the Toronto Branch.

Mr. Geiger is from Ottawa, a graduate of Queen's University with B.Sc. degrees in electrical and mechanical engineering, received in 1922 and 1923. He remained at the University after graduating as a demonstrator in electrical engineering for two years, and in 1924 joined the transmission engineering department of the Bell Telephone Company of Canada at Toronto. He returned to Queen's as a lecturer in 1926. There he was in charge of broadcasting and operating station CFRC and redesigned and rebuilt the broadcasting equipment. He rejoined the Bell Telephone Company two years later, going to the transmission department at Montreal, and transferred in 1930 to his present position as transmission engineer at Toronto.

Mr. Geiger is a member of the Council of Queen's University, and has been a member of the national committee of communication of the American Institute of Electrical Engineers. He is vice-president of the A.I.E.E. Mr. Geiger has been active on the Toronto Branch of the Engineering Institute, and was its chairman in 1947. He joined the Institute in 1922 as a Student, transferring to Associate Member in 1928 and to Member in 1938.

F. J. Ryder, M.E.I.C., has been elected Member of Council of the Institute for the Border Cities Branch.

Born at Holyoke, Mass., he graduated from McGill University in civil engineering in 1929. After graduation he was employed in the draughting department of the Canadian Bridge Company in Walkerville, Ont. In 1938, he accepted the position of sales engineer with the same company in their Toronto Office and served in that capacity until 1943, when he was transferred back to head office in Walkerville to assist in planning and production of war materials. In 1945 he was appointed to the position of assistant shop superintendent in Walkerville, and still serves in that capacity.

Mr. Ryder joined the Institute as a Student in 1928, transferring to Junior in 1935 and to Member in 1942. He served as secretary-treasurer of the Border Cities Branch in 1945, and as chairman of the Branch in 1946.

W. H. Small, M.E.I.C., has been elected Councillor of the Institute representing the Lakehead Branch.

Mr. Small is from Benzonia, Michigan. He attended Michigan State College, graduating in 1908 with a B.Sc. degree in civil engineering. He was first employed as a manual training instructor by the school board at Port Huron, Mich., and in 1909 accepted a similar position in Louisville, Ky. He came to Canada in 1912 as draughtsman for Barnett-McQueen Construction Company, Fort William, Ont., and in 1914 worked with C. D. Howe, as designing engineer. Back in the United States in 1916 he was draughtsman for the Webster Manufacturing Company at Tiffin, Ohio, until his return to Canada and to the Barnett McQueen Company as chief draughtsman in 1917. He was promoted in 1934 to chief engineer and is now vice-president and chief engineer of the firm.

Mr. Small was chairman of the Lakehead Branch in 1946. He joined the Institute in 1939 as a Member.

F. E. Estlin, M.E.I.C., has been elected Councillor of the Institute to represent the Saskatchewan Branch.

Born at Melita, Man., he graduated

D. G. Geiger, M.E.I.C.

F. J. Ryder, M.E.I.C.

from the University of Manitoba with a B.Sc. degree in electrical engineering in 1925. On graduation he joined the Canadian General Electric Company at Peterborough, Ont., being transferred the following year to Winnipeg, as industrial control specialist. In 1932 he moved to Regina, Sask., as sales engineer with the company.

In 1946, Mr. Estlin was chairman of the Saskatchewan Branch, and president of the Association of Professional Engineers of Saskatchewan. He joined the Institute in 1938 as an Associate Member, transferring to Member in 1940.

J. V. Rogers, M.E.I.C., has been elected Councillor of the Institute to represent the Kootenay Branch.

Mr. Rogers, the assistant chief engineer of Consolidated Mining & Smelting Company at Trail, B.C., is from Victoria, B.C. He received the degree of B.A.Sc., in electrical engineering from University of British Columbia in 1933. He did airport and highway work for a time for the Department of National Defense M.D. 11, in Victoria, and he worked in 1934-35 as operator in the Island Falls plant of Churchill River Power Company, Sask., and he later became assistant engineer on construction of the 4th unit extension of the Island Falls power plant.

In 1937 he worked on preliminary plans for a hydro plant for Berens River Mines, Favorable Falls, Sask. He worked then, on the 5th unit extension at Island Falls as construction engineer.

Mr. Rogers was, from 1938 to 1940, mechanical superintendent of the Privateer Mine at Zeballos, B.C., after which he joined Consolidated Mining & Smelting Company as a draughtsman. He was on loan to the Federal government from the Company from 1940-42, as chief draughtsman on construction of chemical plants in Calgary, Alta. Then, on loan to the Alberta Nitrogen Products chemical plant at Calgary, he was plant engineer for about two years. He did work in 1944 on natural gas in Turner Valley, as inspection engineer on loan to the Alberta government. Returning to Consolidated Mining & Smelting Co., he did special work for the chief engineer at Trail, B.C. He was named superintendent of construction and maintenance in 1945, and in 1948 was appointed assistant chief engineer.

Mr. Rogers is a member of the Association of Professional Engineers of British Columbia, and the Trail Board of Trade. He joined the Engineering Institute in 1936 as a Junior, transferring to Associate Member in 1939, and to Member in 1940.

J. E. Cranswick, M.E.I.C., has been elected to represent the Edmonton Branch on the Council of the Institute.

He is from Moore Park, Man., and a graduate in electrical engineering of the University of Manitoba, class of 1929. He spent two years after graduation with Canadian Westinghouse Company at Hamilton, Ont., on a student apprenticeship course. He went to the Edmonton branch office of the Company in 1931 and, apart from one year in Calgary, he has been on sales work in that area since that time. He is at present, branch manager for Canadian Westinghouse in Edmonton.

Mr. Cranswick was chairman of the Edmonton Branch of E.I.C. in 1947. He joined the Institute in 1942 as a Member.

W. N. Kelly, M.E.I.C., has been elected councillor of the Institute representing the Vancouver Branch.

Mr. Kelly was born at Douglas, Isle of Man, and he was educated at Belfast Technical College and at Liverpool University. He served an apprenticeship as engineer with Combe, Barbour and Combe Ltd., Belfast. From 1903 to 1908 he was employed with various firms of engineers at Liverpool. He came to Canada in 1909 and was engaged in various engineering projects in British Columbia. Later, he was appointed superintending engineer with Consolidated Whaling Corporation and North Pacific Sea Products Co. In 1925, he joined the staff of Yarrows Limited in Vancouver. In 1926, he entered private practice as a consulting engineer at Vancouver and has since been carrying on successfully as mechanical engineer and marine surveyor. Mr. Kelly is surveyor to the British Corporation for the Register of Shipping and Aircraft.

The Vancouver Branch elected Mr. Kelly as its chairman in 1943. He had joined the Institute as Member in 1936.

J. V. Rogers, M.E.I.C.

J. E. Cranswick, M.E.I.C.

F. E. Estlin, M.E.I.C.

William N. Kelly, M.E.I.C.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

David Rhys Thomas, M.E.I.C., who was prominent in mining engineering, died on March 4th, 1949, at his home in Toronto.

Mr. Thomas was born near Cardiff, Wales, in 1876, and received his education and technical training in Great Britain. He came to Canada in 1899 and was first employed as an assistant engineer in the engineering department of the Canadian Pacific Railway, in Manitoba and Saskatchewan.

In 1901 he went to British Columbia, where he worked on railway construction. He was later mine surveyor for the Le Roi No. 2 Mine, at Rossland, and in 1903 became surveyor and assayer for Rossland Kootenay Mining Co., Ltd.

In 1905 he went to Mexico where he remained about ten years, during which time he was successively mine superintendent of the Sirena (silver) Mine at Guanajuato, and manager of the Topia Mine (silver lead) and the Predilecta Mine (silver) both in the state of Durango. In 1916 he came back to Canada and was assistant manager of the Moose Mountain Iron Mine at Sellwood, Ontario, and also laid out the original operational scheme for the limestone quarry near Ingersoll, Ont., now operated by the American Cyanimide Company. He returned to Mexico in 1919 to become engineer in charge of exploration for the Mexican Corporation and was afterwards manager of the Teziutlan copper smelter at that time owned or controlled by the above company. While with the Mexican Corporation he was largely instrumental in planning the operational layout at the Fresnillo mine at Zacatceas, a large tonnage low grade silver operation. With the fall in price of silver and base metals in 1921, Mr. Thomas came to New York where he was for a time connected with the formerly well known consulting mining firm of Spurr & Cox Inc.

In 1925 he returned to Canada to take the management of the Argonaut gold mine near Larder Lake, a position which he held until the mine finally closed down in 1928. He then settled in Toronto and devoted himself to consulting work for a few years, finally retiring from active practice in the early "thirties".

Mr. Thomas was a life member of the Institute from 1947. He had become an Associate Member in 1904, and a member in 1913. He also held membership in the Canadian Institute of Mining & Metallurgy, the American Institute of Mining and Metallurgical Engineers, and the Association of Professional Engineers of Ontario.

Frank Herbert Latimer, M.E.I.C., whose death on February 10th, 1948, has only recently come to the attention of the *Journal*, was a life member of the Institute from March, 1946. He was born at Kincardine, Ont., in 1860.

Mr. Latimer had retired from his private practice in Engineering for some time and was in fruit growing business, though retaining his interest in current engineering work.

Mr. Latimer was a graduate of Royal Military College, class of 1882. He did railway work until 1890 in Canada and the United States. He then went into general practice in Vancouver, B.C. He made his headquarters at Vernon, B.C., for a time, and he designed irrigation works for that municipality and for others in the province. He went to Penticton, B.C., as engineer for the Southern Okanagan Land Company about 1911. There he designed municipal water works and electric light for the municipality and others. He was in private practice chiefly on irrigation and surveys. He was a British Columbia land surveyor and a Dominion Land Surveyor.

Probably the most notable achievement of his engineering career was the Southern Okanagan Irrigation Project undertaking on behalf of the British Columbia government from 1918 to 1924, which transformed the area, once only sagebrush and cactus, into one of the richest and most thriving fruit growing sections of the country. Mr. Latimer was actively interested, also, in pharmacy and assaying, philately and golf.

He had joined the Institute in 1916 as a Member.

V. Boshuck, S.E.I.C., who was a student in engineering at University of Toronto, died in December, 1948, at the age of 27.

He was born at Saskatoon, Sask., and was educated at Bedford Road College there. He served as a machinist in the R.C.E.M.E. from 1942 to 1945, and he entered University of Toronto in 1946.

E. I. Armstrong, S.E.I.C., of City View, Ontario, who was a student at Carlton College, Ottawa, died recently. He was born at Kirk's Ferry, Quebec, in 1922.

He was educated at Glebe Collegiate Institute, Ottawa, and entered Carlton in 1947.

C.I.O.S.

Regional Conference

The first Western Hemisphere Regional Conference of the CIOS (Comité International d'Organisation Scientifique) will be held on May 13-14 in conjunction with the 1949 Annual Meeting of the Institute. The Institute is a member of the Canadian Management Council and is co-operating with CMC and with the National Management Council (U.S.A.) and the Instituto de Organizacao Racional do Trabalho (Brazil) in the preparations for this important meeting.

Details of the Management sessions were included in the preliminary programme mailed to members early in April.

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NEWS of the BRANCHES

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Edmonton

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Secretary-Treasurer

Dr. M. R. de Quervain of Davos, Switzerland, addressed a dinner meeting of the Edmonton Branch the evening of February the 22, 1949. This meeting was held in the banquet room of the "Seven Seas" restaurant, with approximately 95 members and their guests in attendance. Dr. de Quervain and Mr. D. C. Pearce just completed a tour of the Canadian Rockies, during which they carried out snow research on behalf of the National Research Council of Canada.

In commencing his address Dr. de Quervain quoted excerpts from a report, "Snow and Ice Research in Canada" by R. F. Leggett of the National Research Council, to the effect that Canadian research was being carried out with a view to improving snow handling equipment, over-snow travel, prevention of ice jams, and the effect of winter conditions on food, clothing and shelter. The speaker said that Canada is making extensive surveys to obtain information on snow storage and its effect on irrigation, erosion, soil conservation, and frost protection. He went on to describe the snow research laboratory in Davos, Switzerland and the methods used in that country. He described penetrometer tests taken in the field, the method of obtaining samples, compressive and tensile tests carried out on these samples, and microscopic examination of snow formations. Dr. de Quervain illustrated his talk with a number of coloured slides and a silent film showing the tests actually being carried out. Following his address Dr. de Quervain presented a film showing Swiss skiiers in action.

All present found the address extremely interesting and educational and were surprised to learn of the progress that has been made in the scientific investigation of snow conditions. The speaker was introduced by H. J. Williamson, and a vote of thanks was moved by L. A. Thorssen.

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On March 10th the Edmonton Branch heard an address on **Synthetic Resins and Some of Their Applications** given by G. R. MacLean of Edmonton. Approximately forty members and their guests were present at the meeting at which Chairman H. W. Tye presided.

Mr. MacLean, who has had considerable experience in industrial chemistry since graduating from the University of Alberta as a chemical engineer, discussed the formation of the various types of resins used in industry; their application to the manufacture of industrial and decorative laminates, plywoods, insulation bats, surface finishes, and their use in oil well plugging and the utilization of wood wastes. The speaker described the manufacture of a typical industrial laminate using a cloth base and a B-stage phenolic resin binder. He also described the process used in manufacturing laminates with a paper base. He stated that the Howard Smith Paper Mills were utilizing lignin in making a decorative laminate with a phenolic resin binder.

In discussing the local picture the speaker stated that he did not think that the present market would support the production of synthetic resins in the Edmonton area despite the fact that all the raw materials are readily available. He discussed the possible use of resins in the local plywood industry and in making insulating board using straw or wood chips as a base. He said that the resins would also find their applications in the oil well drilling and in the manufacture of rockwool insulation. To illustrate his remarks the speaker showed samples of various resins, insulation boards using wood and straw bases, and industrial and decorative laminates.

A lively discussion followed concerning the possible development of such an industry in northern Alberta. The speaker was thanked by P. L. Debney and the meeting adjourned.

Hamilton

I. M. Macdonald, Jr.E.I.C.
Secretary-Treasurer

L. C. Galloway, Jr.E.I.C.
Branch News Editor

Public Transportation in the City of Hamilton was the subject of an address by P. A. S. Todd, general manager of the Hamilton Street Railway Company, at the meeting of the Hamilton branch on October 21, 1948. Fifty-one members and guests came to the meeting at McMaster University and all felt richly rewarded for their attendance. Vice-Chairman N. Metcalfe, occupied the chair, and called upon A. E. Tuck to introduce Mr. Todd to the audience.

Mr. Todd outlined some of the achievements of the Hamilton Street Railway Company since it undertook to operate the street railway system in September 1946, and proceeded to elaborate on some of the problems, such as the handling of peak loads, the distribution and collection of tickets, and the operation and scheduling of equipment and personnel.

Mr. Todd went on to say that at present the system is in a period of reconstruction. Much old and obsolete equipment must be scrapped shortly and plans are being made to revise the transportation system to further the aim of providing good service economically. Such plans, in the face of present shortages of manpower and equipment are fraught with many difficulties and can only be implemented after much hard work and much farsighted constructive thinking.

The interest of the audience in Mr. Todd's address was made evident by the many questions which followed. In conclusion, J. Elliot, expressed the appreciation of those present and Vice-Chairman Metcalfe adjourned the meeting.

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Local pottery manufacturers held the spotlight at the annual Ladies Night of the Hamilton Branch on November 18, 1948. Seventy-five members and guests attended and after dinner, heard an address by Mr. R. B. Hassal of the Smith and Stone Co., Georgetown, Ont. Chairman W. Brown presided, and Neil Metcalfe introduced the speaker.

Mr. Hassal recounted the history of pottery, remarking that its discovery probably came about when early man lined baskets with mud and by accident these baskets were baked. Pottery was made in Egypt and China as long ago as 2500 B.C. The Greeks learned to manufacture pottery, as eventually did the Romans, whose red samian ware supplanted the sun-dried mud ware made by the Britons in England.

Pottery, as an English industry, first appeared in the sixteenth century. Since that time, many improvements in manufacturing processes have brought the English pottery to the position of esteem which it holds today. Mr. Hassal pointed out that the American industry also produces pottery of a very fine quality and is now challenging the long standing superiority of English product.

J. M. Elliot, M.E.I.C., thanked Mr. Hassal for his interesting address and for the remainder of the evening two films were shown. The first, "A Beautiful Necessity", supplied by Sovereign Potters Ltd., dealt with the manufacture of plates, saucers, cups and other pottery.

As a diversion, the second film "Clean Water" dealt with an entirely different subject — that of sewage treatment.

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Once again members of the Hamilton Branch had the great pleasure of hearing an address by John Ness of the Imperial Oil Co., on the subject, **Oil.** The occasion was the Annual Meeting of the Hamilton Branch of the Institute held on January 13, 1949, in the Scottish Rite Club. Sixty-two members and guests attended.

After dinner Chairman W. Brown commenced the business of the evening. The announcement was made that four members of the branch J. P. Gordon, N. L. Crosby, W. G. Milne, M. Pequegnat, had been granted the status of life membership, and congratulations were extended to them. It was also announced that a member of the Hamilton Branch, W. J. W. Ried, M.E.I.C., had been elected to the office of president of the Association of Professional Engineers of the Province of Ontario; and that another member, J. R. Dunbar, had been elected to the office of chairman of the Ontario Division.

The announcement of proposed plans for the founding of a new branch of the Institute at Kitchener, Ontario, caused considerable interest since Kitchener has been in the area served by the Hamilton Branch. The Hamilton Branch joined with Vice-President J. A. Vance who expressed his approval of the plans and his encouragement for the new branch.

The main item of business was the election of officers for the branch for the year 1949. The retiring chairman W. E. Brown expressed his appreciation for the efforts of the other members of the executive during 1948 and his confidence in the executive which was being installed. The newly-elected chairman, Neil Metcalfe, then took the chair, and Mr. W. B. Nicol introduced Mr. John Ness.

Mr. Ness traced the development of the oil industry in Canada from its beginnings in Ontario prior to 1895 to the present developments in Alberta. He illustrated that Canada has been supplying only a small fraction of its own oil consumption. The remainder has been imported from many parts of the world.

Canada's main source of oil has been the famous Turner Valley Field and ever since its discovery, untiring efforts in the search of oil have been exerted in the hope that somewhere in Canada another "Turner Valley" may be hidden. These searches have been in vain until recently when oil was discovered at Leduc, Alberta. The size of the deposit there is of course not known but the prospects of a large deposit are very good and Canada may be on the point of vastly improving her oil situation.

The many questions which followed illustrated the interest of the audience in the speaker's subject. Following them, M. A. Montgomery, thanked the speaker and Neil Metcalfe adjourned the meeting.

Kingston

D. L. Rigsby, M.E.I.C.
Secretary-Treasurer

J. T. Provan, Jr.E.I.C.
Branch News Editor

On Tuesday, February 22, the Kingston Branch of the Institute held a joint meeting with the Engineering Society of Queen's University.

The Engineering Institute portion of the programme consisted of the annual presentation of student papers for which the branch presents prizes. H. L. Armstrong, S.E.I.C., won first prize with his presentation of a paper on **Pulse Code Modulation.** This paper described in detail the theoretical aspects of long distance communication by wire using the pulse code modulation system. The second prize was won by A. D. Kaill who spoke on **Rolling Bearings.** Mr. Kaill's paper covered the importance of choosing the proper bearing for the job, applying it in a proper manner and a systematic maintenance procedure in order to minimize maintenance costs. R. H. Rehder spoke on the **Ward-Leonard System** of electrical control, and was awarded third prize. This paper generally covered the description of the system and its application on rolling mills, mine hoists, elevators, etc.

The guest speaker for the Engineering Society of Queen's University was Dr. J. J. Green, chief research aeronautical engineer, Air Transport Board, Ottawa. Dr. Green spoke on the subject of **Jet Engines,** discussing the advantages and disadvantages of using jet engines in aircraft. He described, with illustrations, the axial flow and radial types of compressors used on these engines, and he spoke in detail of the theoretical aspects of the design of engines of this type, and compared jet engines with the standard piston-type internal combustion engine which has been in use on aircraft since the early days of flying. Dr. Green stated that cooling and structural progress limits piston engine power and that the development of the jet engine has been aided materially by these limitations.

Chairman of the Engineering Society portion of the programme was G. Devlin, while P. Roy presided over the presentation of the student papers. Judges for the papers were Mr. M. G. Saunders, M.E.I.C., Col. L. F. Grant, M.E.I.C., and Professor H. J. Styles, P.Eng.

Dr. Green was introduced by Professor S. D. Lash who was a former classmate of Dr. Green's at the University of London.

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A meeting of the Kingston Branch was held on March 16, 1949 at Gordon Hall, Queen's University. Lt.-Col. W. S. Hunt introduced the guest speaker, Mr. D. H. Parker, assistant designer, A. V. Roe Canada Limited, who spoke on the subject of **Gas Turbine Engines with Special Reference to the Avro Canada Chinook.** Phil Roy, chairman of the meeting, thanked the speaker.

Mr. Parker's talk was illustrated by a sound film showing the general principles of jet propulsion, slides showing in detail the working parts of gas turbine engines, photographs showing assembly methods and machining of parts; and also various actual parts of the engine itself were on hand for visual inspection. The general history of gas turbine engines, fundamentals of jet propulsion, the centrifugal gas turbine engine, the axial gas turbine engine, were discussed, and Mr. Parker concluded with an analysis of the Avro Canada Chinook.

London

G. E. Humphries, M.E.I.C.
Secretary-Treasurer

Robert G. Code, M.E.I.C.
Branch News Editor

A meeting of the London Branch was held on February 22, at Wolseley Barracks Officers' Mess. The Military Engineers Association also attended.

The guest speaker of the evening was Wilfrid Jury, curator of the Museum of the University of Western Ontario. Mr Jury is a well-known authority on Indian life in Canada and has spent a lifetime of research on the early American inhabitants. His address entitled **Digging Into the Past** was found to be extremely interesting, especially to the engineers whose work takes them over the areas Mr. Jury spoke about.

The speaker was introduced by George N. Scroggie and thanked by S. G. Chipman.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

The Niagara Peninsula Branch held a joint meeting with members of The Association of Professional Engineers of Ontario on Thursday, March 3, at The Red Casque Inn.

We were honoured to have as our guests, W. J. W. Reid and Col. T. M. Medland, president and secretary, respectively, of the Association. President Reid spoke briefly to the members on matters of joint interest to the Association and to the Institute, and mentioned his hope for an early consummation of a joint agreement between the Institute and the Association. He expressed sincere appreciation to the branch for the invitation extended to him to address the engineers of this district.

The speaker of the evening was Professor G. B. Langford, professor of mining geology, University of Toronto. His subject was **Shore Erosion of Lake Ontario.**

Over one hundred engineers and landowners and their friends, resident in this district had assembled for this meeting and they were well rewarded by Dr. Langford's exposition of the subject.

He pointed out that the problem of shore erosion of Lake Ontario is one that should receive immediate national attention because of the alarming rat at which valuable land is being lost. This land is of a type that is so scarce in Canda that it should be regarded as a highly important national asset. Dr Langford also pointed out that the problem should receive the attention of the very best engineering talent because the studies necessary and the works to be prescribed, designed and built are of a size and nature that can be brought to a successful conclusion by trained engineers only.

Results of Dr. Langford's investigation, which has been going on over the past several months under government sponsorship, were extensively described and cannot be touched upon in this report, but his story held the fixed interest of the audience and developed a lively period of questions and answers.

A buffet lunch was served after the meeting during which members had the opportunity of meeting the speakers and guests.

Ottawa

J. C. Elliott, M.E.I.C.
Secretary-Treasurer

Capt. A. Bernard, M.E.I.C.
Branch News Editor

The first luncheon meeting in 1949 of the Ottawa Branch was held in the Que-

…bec Suite of the Chateau Laurier on February 10.

The new chairman, A. A. Swinnerton, occupied the chair. The success of this luncheon augurs well for the ability of the new management committee led by Lt.-Col. M. C. S. Brown to keep up the standards set by the 1948 Committee led by S. Hardcastle.

Guest speaker for the occasion was Allan C. Ross, president of the Canadian Construction Association, who gave a very informative talk on **Construction in Canada**. Mr. Ross stressed that as construction men and engineers we have an important stake in and vital responsibility for Canada's future. Membership in the Canadian Construction Association has risen from 200 before the war to 700 today. The Association is now recognized by the Government as the voice of the construction industry.

It is estimated that Canada's Construction Industry in 1949, together with industries indirectly working for construction, will be a $2 billion business. It can well be called a "Barometer of Business". The C.C.A. is urging the Government, and with some success, that public projects unless vitally necessary should be postponed in favour of such things as housing etc. This planning of construction, for better use of our material and labour resources, would greatly help construction costs.

The problem of housing in Canada was an important item in the paper given by Mr. Ross. Climatic conditions, together with a dislike by Canadians of prefabs, make mass production of houses difficult. It was suggested that "packaged housing", whereby all necessary materials, cut to length, and erection drawings are supplied to the builder, might be the answer. Another solution suggested was the "Modular System" where all house components are designed in multiples of certain dimensions such as 4", 8", 12" etc. This latter would require certain changes in the manufacture of basic components such as bricks, etc.

The C.C.A. is strongly in favour of better Dominion-Provincial relations. This would help particularly in setting up a Dominion Provincial Highway Commission which would plan our roads to better open up our resources.

In conclusion Mr. Ross said the C.C.A. had pronounced in no uncertain terms strong belief in free enterprise, founded on liberty of the individual will to operate to the best interests of our country.

Dr. J. J. Green announced the revival of the "Ottawa Aeronautical Section" of the E.I.C. and asked all interested to attend a meeting on February 14.

The Chairman announced the acceptance as a life member Mr. E. Viens, who has been a member of the institute for 35 years. Mr. Viens is a retired member of the Department of Public Works.

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The Ottawa Engineers Wives Association are to be complimented on the huge success of a dance held at Lansdowne Park on February 12. This association founded in 1947 had as its first president Mrs. K. Cameron, wife of Dr. K. Cameron, a past president of the E.I.C.

Officers responsible for the success of the dance were: Mrs. L. M. Christmas, President; Mrs. A. K. Laing, Treasurer; Mrs. T. Foulkes, Secretary; Mrs. S. Parsons, Social Convenor.

Congratulations, ladies, and may we have many such parties in the future.

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A luncheon meeting of the Ottawa Branch was held at the Chateau Laurier on March 10, 1949.

Featured at the meeting were films shown through the courtesy of the Bell Telephone Company in Ottawa, these films were as follows:

"Trouble in Spots"—which gave a very instructive review of trouble encountered in telephone construction and service trouble caused by magnetic storms due to sun spots; preservation of telephone poles; and new methods of cable line construction.

"Telephone Screen Review (No. 3)"—This film describes radio telephone communications, and deals with micro waves beam transmission radio; telephone on trains, and the production of unspoken speech.

"Western Crossing"—This film describes the building of 1600 miles of underground cable from east of the Mississippi to the Pacific Coast. Problems encountered where construction of cable lines cross desert and mountain areas. It also provided interesting information on modern cable laying equipment.

Guests at the head table were: Mr. R. H. Keefler, assistant to the president of the Bell Telephone Company; Mr. J. E. Hutchison, district manager of the Bell Telephone Company; Brig. J. L. Melville; Mr. J. H. Irvine, and Mr. H. R. Welch.

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A luncheon meeting of the Ottawa Branch E.I.C. was held at the Chateau Laurier on February 24, 1949.

The guest speaker Dr. O. M. Solandt, chairman of the Defence Research Board, was introduced by A/M G. O. Johnson.

The subject of Dr. Solandt's talk was **The Defence Research Board.** He mentioned the research organizations existing under the National Research Council and throughout the Services during the recent war, and the recognition in 1944 and 1945 of the necessity of planning a post war research organization.

The Defence Research Board was legally constituted on April 1, 1947. Organization was modelled administratively, to some extent, upon the National Research Council.

Dr. Solandt described the Headquarters Staff of the Board, its relations, with the Armed Forces and with the "research community" throughout the country. Advisory Committees form a link between Defence Research and the Armed Forces and the scientific community of the country.

Research establishments exist from Halifax to Esquimalt. Prominent among them are: the Experimental Station at Suffield, Alberta; the Canadian Armament Research and Development Establishment at Valcartier, Que.; the Defence Research Chemical Laboratory at Ottawa; the Radio Propagation Laboratory at Ottawa; the Defence Research Northern Laboratory at Churchill, Man.; and two naval Research Laboratories, at Halifax and Esquimalt.

The programme of the Board is based on Canadian facilities and resources, said Dr. Solandt, citing Arctic research, chemistry and anti-submarine research as some logical participants.

Engineers, he said, are important to every stage of the work, and the tendency to do more research and development in engineering schools should make Canadian industry more independent of help from other countries in the future, providing management will take full advantage of the opportunity.

While matters of defence have been uppermost in the programme of the Board, those of civil defence, and both offence and defence in the war of ideas will also be studied. This last field is one of the most complex fields of psychology, but there is no doubt that it is a legitimate activity of the Board.

Dr. Solandt closed by remarking that the best hope of preventing another war is to show that we are strong and that the operation of the Defence Research Board constitutes one of the means by which that strength can be developed.

Guests at the head table were: Air Vice-Marshal C. R. Dunlop; Major-Geenral F. F. Worthington, and Mr. W. D. Laird, assistant general secretary of the E.I.C.

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

A. R. Bonnell, M.E.I.C.
Branch News Editor

Ladies night at the Saint John Branch was held as a dinner meeting in the Admiral Beatty Hotel, Thursday evening, February 17.

After refreshments and dinner, a toast to the ladies was proposed by Malcolm Redding and responded to by Mrs. Victor Chestnut.

Ira P. Macnab, regional vice-president, of Halifax, was the speaker for the evening, this being his official visit to the Saint John Branch.

Mr. Macnab spoke briefly on Institute affairs, and then, for the benefit of the ladies present, enlarged on his experiences while working in Venezuela. The audience was impressed with Mr. Macnab's description of his encounters with snakes, with strange Venezuelian food and customs. He told of being personally acquainted with the late Signor Gomez, former dictator of Venezuela, and told of the good that the dictator did for his country in promoting industry. Most of the audience had only known of the late dictator's weak points.

Rod Richardson thanked Mr. Macnab for his talk, on behalf of the Branch.

Following Mr. Macnab's talk, colour motion pictures of Nova Scotia were shown. The pictures were of particular interest to vacationists.

H. P. Lingley, Chairman of the Branch, presided over the meeting.

Sarnia

C. P. Sturdee, M.E.I.C.
Secretary-Treasurer

J. M. Garton, Jr.E.I.C.
Branch News Editor

Ninety-three members and guests of the Sarnia Branch attended the first meeting of the year—a dinner meeting held at the Polymer Cafeteria on January 20. The guest speaker K. H. Braithwaite, vice-president of Fiberglas Canada Ltd., outlined the history of glass making and described the highly specialized methods of producing glass in fibre form. Mr. Braithwaite described the uses of the various types of glass fibres and some of the control testing required to obtain maximum insulating value. Following Mr. Braithwaite's interesting talk, a trip was made through the recently constructed plant of Fiberglas Canada Ltd.

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The second meeting in 1949 was held on February 23 at the Lutheran Hall. At this meeting, the Sarnia Branch was host to the Sarnia Section of the Chemical Institute of Canada. Following the dinner, the guest speaker, John Ness, retired geological expert of Imperial Oil Ltd., spoke on **Western Oil Developments.** Mr. Ness outlined the history of oil production and, in particular, Canada's role. The speaker described the development of the Southern Ontario fields, Turner Valley, Norman Wells, and the Leduc and Redwater areas. While Canada is still a major importer of oil, her position as a producer is rapidly strengthening.

In answering questions from the floor, Mr. Ness described the admirable way in which the Province of Alberta is handling the conservation aspects of its oil resources.

Following Mr. Ness' address, a new film, "A Mile Below the Wheat", was shown. This film, produced by Imperial Oil Ltd., gives a pictorial story of the discovery and development of the Leduc field.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bing-Wo, M.E.I.C.
Branch News Editor

The Annual Meeting of the Saskatchewan Branch of the Institute and the Association of Professional Engineers of Saskatchewan was held in the Canadian Room of the Hotel Saskatchewan in Regina on February 18. The Annual Reports of both bodies were read. Reports of committees were presented as well as a report on the Saskatoon Section by J. B. Mantle, the local secretary. The election of officers for both Institute and Association offices was held.

The annual dinner took place in the private dining room of the Hotel Saskatchewan. Guest speaker was the Hon. W. S. Lloyd, Minister of Education for Saskatchewan, speaking on the subject **Technical Education.**

Mr. Lloyd traced the development of the growth of technical schools in Saskatchewan. He pointed out the need for institutions to train the young people of the province in practical skilled trades as differentiated from those who wanted the purely academic type of training. Large technical schools are now operating in the cities of Regina, Moose Jaw, Saskatoon and Swift Current with smaller schools being set up in many other districts. In sparsely settled districts where it has been impractical to form a school, the government provides itinerant teachers who travel about a route taking the education facilities to the students.

Past-president E. K. Phillips moved a vote of thanks to the Hon. Mr. Lloyd.

Saskatoon Section

J. B. Mantle, M.E.I.C.
Secretary

At a dinner meeting on January 26, 1949, with a record attendance of 110, the Saskatoon Section heard S. A. Kerr, resident geologist for Imperial Oil Limited at Leduc Oil Field, speak on the subject of the **Leduc Oil Field.** Mr. Kerr showed, with the aid of slides, the extent of the field and many details of the geological formations underlying it. Production figures were interesting; five million barrels of oil have been taken from the field to date with estimates on the amount remaining running as high as 170 million barrels. The present controlled production rate is 24,000 barrels per day.

Details as to the causes of the eruption last year of the Atlantic No. 3 well were given. Efforts to arrest the oil flow included stuffing the crater with 1,000 tons of roughage ranging from chicken feathers to cotton seed hulls. In view of the ever present fire hazard two inclined relief wells were drilled, one of these being completed the day before a fire resulted due to the derrick falling into the crater. The fire was snuffed out two days later by pumping tons of water down the relief well.

After the meeting Mr. Kerr answered a multitude of questions about Leduc.

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On February 24, the Saskatoon Section held a dinner meeting with the noted Swiss snow scientist, Dr. M. de Quervain as guest speaker. Dr. de Quervain, presently attached to the National Research Council's Division of Building Research, indicated with the aid of slides and a film the measures that had been taken by Switzerland to increase the knowledge of **Snow Mechanics** and to apply this knowledge in the overcoming of snow problems. Most of the research had been carried on at the Swiss Institute of Snow and Avalanche Research, established in 1943. Very careful and ingenious procedures were giving information on little known properties of ice and snow. Some properties studied were: evaporation rate; friction; grain size (observation under polerized light); heat conductivity; hardness; air permeability; tensile, compressive and shear strengths; plasticity and creep. Avalanches and snow slides were being prevented by tree planting, by agitation to prevent snow accumulation and by strategic placement of wooden retaining walls. A set of snow measuring instruments, the property of the National Research Council, was displayed and aroused much interest.

The well attended meeting, 97 being present including five guests from the University Physics Department, was given an opportunity of comparing the beauty of Switzerland and our own Rocky Mountain area. Dr. de Quervain showed several coloured slides of his own land while Dr. N. B. Hutcheon presented some of his coloured slides of Banff, Alberta.

Toronto

R. A. Muller, Jr.E.I.C.
Secretary-Treasurer

M. W. Huggins, M.E.I.C.
Branch News Editor

Monday night, January 31 was the annual Student's night of the Toronto Branch. Five excellent papers were presented by students of the engineering faculty of the University of Toronto.

The first prize of $50.00, donated by the T. Eaton Co. Ltd., was won by Paul LaPrairie of third year mining engineering, who spoke on **The Rock Burst Problem.** In his excellent paper he explained the causes of the two main types of rock burst which were of the surface and deep or seismic variety. He outlined the history of rock bursts insofar as it is known and went on to explain that Canada, as a result of an intensive research programme instituted in 1934 through the Ontario Mining Association and the National Research Council, is far ahead in this field.

The second and third prizes, of thirty and twenty dollars respectively, were donated by the Dickie Construction Co. Ltd. Second prize was won by G. C. McHaffie of fourth year mechanical engineering for his very interesting paper, **Some Thoughts on Vibration.** He discussed all types of vibration, from earthquakes to leaf flutter. He explained the causes of automobile wheel shimmy, motorcycle road wobble, suspension bridge oscillation, penstock vibration, turbine blade failure and numerous other types of vibrations. He closed by saying that vibration is a willing servant but an impossible master.

A. T. Patterson of fourth year engineering physics won third prize for his excellent paper **Electrostatic Precipitation of Dust.** A considerable part of the paper was based on his own experience with a precipitator built by himself and used in a hot air heated home. He brought the need for such equipment very close to home by showing a bacteria culture from a sample of University of Toronto air. There was a great contrast between this and another culture inocculated with electrostatically precipitated dust.

The remaining two speakers were: V. L. Richards of fourth year engineering and business, a prize winner last year, who presented a most interesting paper on the development of **The High Compression Automobile Engine;** and W. B. Duncan of third year mechanical engineering who spoke on **Magnetometers and Geophysical Surveys.**

The judges had great difficulty in selecting the three prize winners as all papers were excellent.

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A symposium on welding was held by the *Toronto Branch* on Thursday evening, February 24. The speakers were R. M. Gooderham, manager of the Canadian Welding Bureau; Ramsay Moon, welding consultant to the supporting organizations of the Canadian Welding Bureau; and Gordon Cape, welding engineer from the Dominion Bridge Company's Lachine office.

The meeting, held in the Physics Building of the University of Toronto, was attended by about 200. Members of the Canadian Welding Society were the guests of the Branch.

Mr. Gooderham presented an excellent paper on the work and aims of the Canadian Welding Bureau. He explained that despite its prime function as an approvals division of the Canadian Standards Association, because of the existing conditions it has been necessary for it to sponsor the development of educational programmes for engineers, welding technicians and welders. He pointed out, however, that it was hoped to expand the existing educational facilities of our universities and the new technical institutes in Ontario so that adequate welding training will be provided and the Bureau may then return to its most important field of operation; namely the preparation of codes and the certification of personnel and firms performing welding. By so doing it is confidently expected that Canadian welded products prepared to the Canadian Welding Bureau standards will receive world-wide acceptance

Mr. Moon confined his paper to a discussion of the welding research developments which have occurred in the past and those which may occur in the future. Mr. Moon stated that welding research has been so intensive that knowledge of fatigue stresses in welded structures is now ahead of our knowledge of the same stresses in riveted structures. He stated that in the future engineers are going to be much more concerned with ultimate capacities of structures and will be using the principles of limit design. He described developments in size of weld, type of electrodes, temperature control, fatigue stress reduction, and metallurgy of welding. He also described some very interesting experiments which were carried out on the welded liberty ships to determine loads and stresses in operation. He explained that Hitler favoured welding and as a result the German welding research has been very extensive. He stated that expenditures in welding research on this continent are still rather small.

Mr. Cape presented a very interesting paper, with illustrations, showing the many fabrication problems which must be solved and how some of them are solved. He cited a number of lessons which had been learned from experience and explained how these lessons had led to the development of fabrication rules. The explanations of how the various difficulties were overcome was most clear and it is certain that a very lengthy discussion would have developed had there been time available.

The vote of thanks was moved by D. D. Whitson.

Junior Section

R. C. Harris, s.e.i.c.
Secretary

On February 21, 1949, a meeting was held in the new mechanical engineering building of University of Toronto, when two speakers gave different aspects of the topic **The Professions and their Relation to Everyday Life.** Dr. R. W. I. Urquhart, medical director, of the Hydro Electric Power Commission of Ontario, outlined the training of a doctor, and his subsequent work as a general practitioner. The dangers of complete concentration were illustrated by contrasting the work of a specialist and of a general practitioner and it was said to be beneficial to stand back from time to time to study the general picture.

The growth of industrial medicine was outlined; with this the relation between doctor and patient became clear. The doctor's only thought is the good of his patient, status and financial benefit being disregarded. His attitude should be common to all professions. One should only consider and serve the best interests of the client.

Dr. Urquhart concluded with a few sentences on the importance of one's relationships with others. Human relations are continuous through one's life, and it were wise to cultivate interest and facility in these affairs.

Professor E. A. Allcut of the mechanical engineering department of University of Toronto, began by defining a profession and a trade. By numerous similes and parables he illustrated the close connections between the fundamentals of medicine, engineering and law.

Each profession has its training and apprenticeship period, leading to membership in a guild or professional association. In each profession, clarity of expression is a fundamental necessity, allowing the desirable interchange of ideas. A branch of a profession should not be practised to the exclusion of all others, nor must the humanities be neglected.

If there be any difference in status between engineers on one hand and lawyers and doctors on the other, it may be due to the fact that recognition of engineering as a profession has occurred so recently in comparison. Engineering must maintain and even improve its standards in the coming years.

The Junior Section plans include among its activities a stag party, and a field trip to the Des Joaquins and Stewartville developments of the H.E.P.C. of Ontario.

Vancouver

A. G. Fletcher, s.e.i.c.
Secretary-Treasurer

Stuart Lefeaux, jr.e.i.c.
Branch News Editor

The Vancouver Branch of the Engineering Institute held the annual Students' Night on Wednesday, February 16, 1949. There was a good attendance to hear the three papers chosen from twelve given by U.B.C. Engineering students in a preliminary contest.

Martin Dayton spoke on **Sewage Disposal for Kamloops, B.C.** Mr. Dayton, a fourth year civil engineering student briefly outlined the existing sewage disposal system and went on to explain how it could be improved.

Ivan Sorensen, a third year civil engineering student, spoke on **Henriette Lake Dam B.C.,** giving a clear account of the problems and methods of construction from the foundation to the spillway. After he had taken the audience through the entire construction with blackboard illustrations and verbal descriptions he showed, on the screen, a series of photographs of the project from beginning to completion.

Cyril White, a third year mechanical engineering student spoke on **Construction and Manufacture of Wire Rope.** Mr. White explained the manufacture of steel for wire ropes and described several patterns to which wire ropes are constructed. He explained what preformed strands are and demonstrated their advantages with various samples.

All three papers were well treated and delivered. After the judges announced the decision as to the first, second, and third prizes Mr. T. Berry, branch councillor, made the awards of three book prizes presented by Sumner Iron Works Ltd., Dominion Bridge Co. Ltd., and Canadian Liquid Air Ltd.

Victoria Branch

D. A. MacLean, jr.e.i.c.
Secretary-Treasurer

T. A. J. Leach, m.e.i.c.
News Editor

An interesting address was given by A. L. Carruthers on **Okanagan Flood Control** to members of the Victoria Branch on Friday, February 18, at the Prince Robert House.

The Okanagan Basin cuts across the 49th parallel and lies in the westerly half of the Monashee Mountain plateau in southern B.C. The valley extends southerly into Washington for 73 miles and northerly through British Columbia to Vernon.

Within this trough is found Okanagan Lake, which drains south from Penticton through Okanagan River, Skaha Lake, Okanagan Falls, the Town of Oliver, Osoyoos Lake, and finally joins the Columbia River at Brewster in Washington.

Mr. Carruthers discussed the topography of the basin; the economic and climatic conditions, and the history of water control activities in the area.

Following the flood of 1942, matters were brought to a head and a Dominion-Provincial Board was appointed to study all matters related to lake and river control and to recommend remedies. A survey of the Okanagan was carried out under the Provincial Department of Public Works, covering the valley floor from Penticton to the boundary, covering an area approximately 35 miles in length by 2½ miles in width. In addition a geological survey was made by the Department of Mines and Resources. For hydrological studies of the Okanagan River 30 gauging stations were added to the four existing ones. Studies followed to obtain the most beneficial control with the idea of assuring 1½ feet storage to satisfy irrigation demands.

As the present control range of 3 feet had proved inadequate this was increased to 4 feet with a range from 98.5 to elevation 102.5. This is to be accomplished by the construction of a new control dam at Penticton. In case of emergency the level can be drawn down an additional foot. This is to provide irrigation demands of Oliver during a possible drought period.

Further recommendations made by the Board included the construction of a 22 mile outlet channel down as far as Osoyoos Lake on the International Border. This channel would have a capacity of 2100 c.f.s. at the dam and this would increase down-stream to 3800 c.f.s., to allow for tributary inflow. With berms of 10 ft. on each side of the channel and the banks built up 4 ft above high water level a factor of safety would be provided in case the water overtopped the channel section.

As the new channel is considerably

(*Continued on page 242*)

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CIVIL

CIVIL ENGINEER with at least 2 years practical experience required by a large inter-municipal Corporation in Western Canada. Under supervision and direction applicant must be able to assist and perform technical engineering work, prepare plans, perform field duties in connection with the construction and maintenance of simple structures, to install equipment, supervise and direct small groups of men. Salary $235 up. Apply to File No. 1144-V.

RESIDENT CIVIL ENGINEER required to take charge of municipal improvements by firm of consulting engineers in Prairie Provinces. Give full details of age, qualifications and experience. Salary open. Apply to File No. 1148-V.

CIVIL ENGINEER, 25 to 30 years of age, preferably veteran with some experience in construction field. Duties and future would lie in supervision and later some administration. Position offers long term security, pension, etc., and reasonable advancement with merit. Salary open. Apply to File No. 1149-V.

JUNIOR CIVIL ENGINEER preferably with some experience in construction work required in Alberta by company starting the construction of a new hospital. Salary open. Apply to File No. 1152-V.

ELECTRICAL

ELECTRICAL ENGINEER required by city in Western Canada. Duties will primarily be concerned with designing of all new electrical work for any city department also inspecting and checking existing installations. Work will be under the supervision of the Superintendent and the Assistant Superintendent. Salary $250 to $300 per month. Apply to File No. 1143-V.

GRADUATE COMMUNICATION ENGINEERS, Canadian citizens, interested in audio, radio and video frequency systems engineering. Salaries up to $350 per month depending on qualifications, location Montreal. Apply to File No. 1147-V.

ELECTRICAL ENGINEER, who could be responsible for operation and maintenance of electrical, air conditioning and instrument systems for large, modern industrial plant in Eastern Ontario. Electrical trades experience is essential but training would be provided on air conditioning and instrument work. Apply to File No. 1155-V.

MISCELLANEOUS

MANAGER OF MANUFACTURING required by Canadian mill producing 500 tons per day of specialty papers, tissues, paperboard and newsprint. Position requires proven managerial ability and technical qualifications for the production of paper. Location most desirable and salary attractive. Apply to File No. 1140-V.

DESIGNING AND STRUCTURAL ENGINEERS required by Provincial Government West Coast. Duties include designing and preparation of plans of bridges, ferries, wharf structures, etc., in timber, steel or concrete. Preferably with experience in bridge design and construction. Salary $3,504. rising to $4,104. per annum. Apply to File No. 1142-V.

CIVIL OR SANITARY ENGINEER, with a number of years experience required by a large intermunicipal Corporation in Western Canada. Must be able to assume responsibility in design, detailing, estimating, preparing specifications, to layout and supervise the construction repairs and maintenance of a sewerage collection system and treatment plant. Salary $325 per month up. Apply to File No. 1144-V.

SUPERINTENDING ENGINEER for Eastern University to take charge of physical plant maintenance and help plan the building program. Salary from $350. Apply to File No. 1145-V.

SALES ENGINEERS required by control equipment manufacturer, one man needed for industrial sales and one with background in heating and ventilating. Headquarters in Montreal. Salaries open. Apply to File No. 1146-V.

TOWN ENGINEER required by town in Ontario. Duties include supervision of Board of Works as well as complete charge of municipal, electrical water and telephone department projects. Salary open. Apply to File No. 1150-V.

CHIEF ENGINEER required by large public utility system in Eastern Ontario. Applicants must have had experience in the operation and design of electric or waterworks systems. Salary open. Apply to File No. 1151-V.

MECHANICAL AND CHEMICAL ENGINEERS required for junior positions in Montreal. Salaries open. Apply to File No. 1154-V.

ASSOCIATE PROFESSOR in organic Chemistry and fuels Technology. Duties will be to teach a first course in Organic Chemistry to junior students, a course in Organic Unit Processes in the senior year, and such other work as may be assigned. Special emphasis will be given to Chemical Utilizations of Solid and Liquid Fuels, including gasification, hydrogenation, etc. Apply to File No. 1156-V.

ASSISTANT PROFESSOR of Mineral Engineering. Duties will be to instruct in Mineralogy and Mineral Dressing with special reference to coal and the industrial minerals, and they will include operation of the mineral dressing laboratories for commercial testing of ores and processes. Apply to File No. 1156-V

DRAUGHTSMEN, required by G. E. C. Switchgear Department, Engineering Works, Witton, Birmingham, 6, England. Must have good experience in any class of switchgear design or layout. Permanency and good opportunities for capable men. Apply, stating age, experience and technical qualifications to File No. 1157-V.

The following advertisements are reprinted from last month's Journal, having not yet been filled.

CHEMICAL

CHEMICAL ENGINEER required by large Western Industrial manufacturing Concern. Applicant must be interested in boiler water treatment. Salary open. Apply to File No. 1103-V.

CHEMICAL ENGINEER OR CHEMIST recent Ph.D. or equivalent with good background in organic chemistry preferable along the lines of wood and cellulose chemistry and fuels technology. Applicant needs capacity for contacting plant personnel and appreciation of engineering phases of problems. Position in British Columbia. Salary open. Apply to File No. 1118-V.

CHEMICAL ENGINEER recent graduate, required for position in technical department of a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 1122-V.

CHEMICAL ENGINEER required as plant chemist by large newsprint mill. Preferably four to six years in the pulp and paper industry in chemical and control departments. Salary open. Apply to File No. 1131-V.

CHEMICAL ENGINEER required in Ontario. Duties will involve the compounding for and quality control of industrial rubber goods. Previous experience in the rubber industry would be an advantage. Salary open. Apply to File No. 1133-V.

CHEMICAL ENGINEERS required by chemical plant in Province of Quebec. Duties include responsibility of the production and the operation of chemical equipment, such as filter presses, evaporators, vacuum jets, solvent recovery, etc. Salaries open. Apply to File No. 1134-V.

CIVIL

CIVIL ENGINEER required for a consulting engineers practice in the Maritimes. Preferably with three to six years experience. Duties both design and field supervision of construction for both municipal works and industrial buildings. Engineering survey experience required. Salary open. Apply to File No. 1087-V.

CIVIL ENGINEER, age 35 to 40 years, required by Public Institution for Montreal area. Must have construction experience and be able to supervise large building program. Salary $6,000 to $7,000. Apply to File No. 1091-V.

CIVIL ENGINEER, required in Ottawa, Ontario, must have at least ten years experience in the design of frame houses and wood structures. Salary open. Apply to File No. 1108-V.

CIVIL ENGINEERS, required by public utility in Toronto. Must have at least five years experience in design of steel structure on power developments. Salary open. Apply to File No. 1109-V.

CIVIL ENGINEER, recent graduate, required by Montreal firm of contractors and engineers. Applicants must have an understanding of the following subjects or be prepared to acquire same: general construction, engineering, estimating, elementary surveying, construction practices, etc. Salary entirely dependent upon ability. Apply to File No. 1114-V.

ASSISTANT CITY ENGINEER required for city of Calgary, Alberta. Applicant must have executive ability and preferably experience in Municipal work covering sewers, sewage disposal, streets, paving, sidewalks, bridges, building construction and town planning. Salary range $3,500 to $4,500. Apply to File No. 1125-V.

ELECTRICAL

JUNIOR ELECTRICAL ENGINEERS required as assistants to works engineers by a large chemical manufacturing company with headquarters in Montreal. Applicants should have passed the C.G.E. Test course. Position in Ontario. Salary open. Apply to File No. 1084-V.

ELECTRICAL ENGINEER recent graduate, required for Canadian branch plant of a progressive, established American company. Duties to be production control working closely with sales. Permanent position for right man with excellent opportunity for advancement. Location Toronto. Salary open. Apply to File No. 1088-V.

ELECTRICAL DESIGNING ENGINEER required for plant engineering department. Preferably between the ages of 30-40 years, with 10 years of electrical design experience in industrial plant construction and maintenance. Position in Ontario. Salary open. Apply to File No. 1100-V.

ELECTRICAL ENGINEER, preferably with experience in electrical trouble shooting and maintenance work required by industrial firm in Toronto. Salary open. Apply to File No. 1101-V.

ELECTRICAL ENGINEERS, experienced in the maintenance of power meters and relay protection schemes also men experienced in installation of large rotating electrical machines, high voltage and low voltage switch gear. Manufactures test, experience preferred. Positions with public utility in Toronto. Salaries open. Apply to File No. 1109-V.

ELECTRICAL ENGINEERS required by public utility in Toronto. Must have the folowing experience: Design layout and estimates for medium and large, low voltage and high voltage substations or design and construction of transmission and distribution lines. Salary open. Apply to File No. 1109-V.

ELECTRICAL ENGINEERS required by public utility in Toronto. Must be experienced in communications preferably a specialist in radio and frequency modulation, also knowledge of power and telephone line carriers required. Salary open. Apply to File No. 1109-V.

ELECTRICAL ENGINEERS required in Latin America as assistant to Manager on Public Utility system. Must have broad experience in operation and maintenance of generating plants, substations, transmisison lines and distribution systems. Ability to speak Spanish desirable but not essential. Salary open. Apply to File No. 1112-V.

ELECTRICAL ENGINEER for sale of electrical and allied machinery in Southern Alberta to open branch office in Calgary. Must have trade contacts and interest in firm can be purchased by a proven suitable man. Apply to File No. 1123-V

ELECTRICAL ENGINEER between 35 and 40 years of age with a minimum of five years experience with a public utility or related industry required as Manager's Assistant for electrical distribution system in fast growing town of 25,000 population. Salary open. Apply to File No. 1124-V.

JUNIOR ELECTRICAL ENGINEER required in Toronto for designing Selenium Rectifiers and some Carrier Current Control equipment. Salary open. Apply to File No. 1136-V.

SENIOR ELECTRICAL DRAUGHTSMAN required in Toronto. Must have considerable experience on generating and substation layouts. Salary open. Apply to File No. 1137-V.

MECHANICAL

MECHANICAL ENGINEER required as Plant Engineer by a pulp and paper mill in the province of Quebec. Should have about ten years experience, the major part in the pulp and paper industry. Applicant will be requested to take complete charge of maintenance department consisting of various trades crews with a total personnel of about 250 men. Salary open. Apply to File No. 1099-V.

MECHANICAL ENGINEER, required as Service Promotion Man for Export Division of large National Organization. Must have good technical background and service experience in the automotive industry. Responsiiblities include writing and editing promotion material, policies, bulletins and effective letters. Salary open. Apply to File No. 1110-V.

MECHANICAL ENGINEER recent graduate required as sales Engineer by a firm of Power House and Dust Collection Specialties. Job located in Ontario and training period in Montreal. Salary $250.00. Apply to File No. 1126-V.

METALLURGICAL

METALLURGICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in research, development and production. Salary open. Apply to File No. 1106-V.

MISCELLANEOUS

GRADUATE ENGINEER required as Sales Promotion Manager by well established manufacturer of heating equipment used in all types of buildings. Age 30 to 40 years with experience in selling mechanical equipment in the construction industry and preferably with Business Administration Course. Salary open. Apply to File No. 1085-V.

AIRCRAFT STRESS ENGINEERS AND DESIGN DRAUGHTSMAN required by Canadian company. Must have aircraft design experience or at least two years experience in stressing of aircraft structures. Salary open. Apply to File No. 1089-V.

GRADUATE ENGINEER 30 to 40 years of age with 3 or 4 years experience in railroad engineering required in Montreal to take charge of railway division. Must be bilingual. Salary open. Apply to File No. 1090-V.

SALES ENGINEER for contractors equipment and allied lines required by large manufacturer, Niagara Peninsula. Salary open. Apply to File No. 1095-V.

HEATING AND VENTILATING ENGINEER with some experience in mechanical equipment for buildings is wanted for office work on heating, ventilating and air-conditioning by a firm of consulting engineers in Montreal. Salary open. Apply to File No. 1096-V.

COMBUSTION ENGINEER, wanted by large industry near Montreal. Must be capable of taking charge of high pressure boilers, turbo generators and boiler house personnel. Permanent position and good salary. Apply to File No. 1105-V.

GRADUATE ENGINEERS interested in applied research in inorganic physical chemistry required for research laboratory of Montreal firm. Applicants should have from two to five years experience. Salary open. Apply to File No. 1107-V.

ELECTRICAL OR MECHANICAL ENGINEERS, with experience in electrical, industrial and commercial equipment and domestic appliances for frequency conversion program. Position with public utility in Toronto. Salary open. Apply to File No. 1109-V.

DISTRIBUTION ENGINEERS required in Latin America must have at least five years experience design and operation of overhead electric distribution systems. Salary open. Apply to File No. 1112-V.

GENERAL OPERATING SUPERINTENDENT, required by large electric utility company in the far east for three large interconnected hydro electric generating plants. Applicants must be thoroughly experienced in operation and maintenance of hydro electric generating equipment. Salary open. Apply to File No. 1112-V.

GRADUATE ENGINEERS, preferably with 6 to 10 years postgraduate experience to act as field representatives of Technical Information Service, N.R.C. in Montreal and Toronto. As the work involves personal visits to industrial firms personally owned car is essential. The Montreal representative must be fluently bilingual. Apply to File No. 1115-V.

GENERAL MANAGER required for Saskatchewan Power Commission. Position requires full responsibility and authority for all operations. Principal requirements, administrative, engineering or other technical experience in power operation very desirable. Salary open. Apply to File No. 1117-V.

SALES AND SERVICE ENGINEERS required for selling and servicing of water treatment chemicals and water treatment equipment of all types throughout Canadian industry. Considerable travelling involved. Applicants preferably not over 27 years of age. Positions located in Southern Ontario and Maritimes. Salary open. Apply to File No. 1120-V.

CIVIL OR MECHANICAL ENGINEERS required for openings in connection with construction of new refinery being built at Montreal East preferably some experience in heavy chemical industry also junior vacancies. Salaries open. Apply to File No. 1128-V.

JUNIOR SALES ENGINEER, preferably mechanical background, required in Montreal by large industrial firm. Preferably with a couple of years experience and the desire get into sales work. Salary $250. Apply to File No. 1130-V.

JUNIOR ENGINEER required by American Company for their three factories located in Canada. Duties include supervision of office routine order supplies, etc. Knowledge of French and English would be an advantage. Salary open. Apply to File No. 1132-V.

MAINTENANCE ENGINEER mechanical or electrical background with about ten years experience including plant maintenance. Duties include responsibility for mechanical and electrical maintenance, general supervision of power plant and mechanical stores. Salary open. Apply to File No. 1135-V.

JUNIOR ENGINEER with three to five years experience, preferably mechanical required in Montreal to develop equipment specifications, sources of supply for equipment and generally look after the routine of an engineering office. Apply to File No. 1135-V.

DRAUGHTSMAN with five to ten years' experience in plant layout material handling equipment and some structural required by an electro-metallurgical plant located in Northern Ontario city. Salary open. Apply to File No. 1139-V.

AERODYNAMICIST capable of carrying out performance and stability calculations for initial design. Permanent position with good prospects, in Montreal area. Salary open. Apply to File No. 1159-V.

Situations Wanted

MECHANICAL ENGINEER, M.E.I.C., University of Toronto, Canadian Citizen, experience in Canada and abroad, knowledge of several languages. Desires contacts in view of changing the actual line of work with better salary. 37 years of age, married with small family. Great practical and theoretical knowledge in Thermodynamics, hydraulics, aircraft and furniture making and finishing also all systems of production control. Minimum salary accepted $7,000 per year. Apply to File No. 140-W.

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Queen's, age 49. Five years hydro-electric power development construction, one year industrial building construction, two years sales engineer and estimator architectural ironworks concern, fourteen years oil refinery on initial construction, on operations and maintenance, last six years refinery engineer in charge of maintenance safety, equipment, inspection, design and construction of plant changes and extensions, industrial buildings. Resigned to undertake private venture. Desires to re-enter industry. Apply to File No. 166-W.

MECHANICAL AND ELECTRICAL, M.E.I.C., P.Eng. (Ont.). Age 41. Single. Overseas 1940 with R.C.E., followed by 7 years as Technical Staff Officer, British Army, on Research and Development, including period as Head of Technical Intelligence Mission to Austria. Vickers Plant Course followed by 13 years Canadian experience including Telephone Plant; Automobile; Electrical Power Apparatus and Wire and Cable; Design and Manufacture Electric Cranes, Foundry Equipment Diesel Engines and other Heavy Engineering Products. Intimate knowledge British Ministry of Supply and Engineering Industry. Pre- and Post-War knowledge of all Europe, particularly Belgium, Switzerland, Austria and Czecho-Slovakia. Interested in European position for Canadian or U.S. firm or Administrative Engineering Post in Canada. Apply to File No. 415-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Sc.(E.E.) Manitoba 1943. Age 27. Married. Electrical experience with R.C. Signals and 2½ years general electrical

Field Technical Representative

Required, immediately, graduate Engineer — required by large well known firm — preferably with mechanical background and sales experience — to travel, extensively, in Eastern Canada as representative for a distributor of pneumatic material-handling equipment. Principal contacts will be in cement, heavy chemical, food, pulp and paper, brewing and aluminum industries.

Must be able to write concise and accurate letters and reports.

Good salary and opportunities for advancement.

Write:—Give complete professional biographical data, enclose recent photograph, state salary required.

File No. 1158-V.

experience in industry. Sales training. Presently employed but desires position offering wider scope and opportunity. Preferably Montreal area. Apply to File No. 925-W.

PRODUCTION ENGINEER, M.E.I.C., P.ENG., McGill '33 (Electrical). Married. Extensive knowledge business organization and management. Accustomed to conferring with top Executives. Broad experience includes sales, plant organization and management, interpretation and use financial reports and plant operating statements, budgetary control, production plannings, cost development and control, method improvements, plant layout and general engineering. Desires permanent association, offering good future possibilities, with well established manufacturing or sales organization. Available on reasonable notice. Apply to File No. 1186-W.

MINING GRADUATE, M.E.I.C., with twenty years experience in mine operation and development, and associated construction, etc., desires permanent connection with senior responsibility; Ontario location preferred. Apply to File No. 1252-W.

ELECTRICAL ENGINEER, M.E.I.C., P.E.Q., B.Eng., McGill '34, age 40, married, bilingual. 15 years sales and service of industrial electrical and welding equipment. At present in charge of sales and administration for Canadian company. Desires position of responsibility with well established progressive company. Location preferably Quebec or Ontario. Home in Montreal. Available on short notice. Apply to File No. 1421-W.

GRADUATE CIVIL ENGINEER, M.E.I.C., P.Eng., Que. Experience in the Engineering Department of large Corporations. Considerable experience in hydraulic and design and building of reinforced concrete structures. Several years as construction and field engineer on various plants and hydraulic power projects. Desire position with well established firm. Presently employed. Apply to File No. 1527-W.

MECHANICAL ENGINEER, M.E.I.C., McGill 1940. Age 33. Married. Experienced in plant and canal construction, shop work and shop management, cost estimating and control, aircraft maintenance and design. Previous positions include company chief inspector and assistant superintendent. Seeking responsible position in Montreal area. Available three weeks notice. Apply to File No. 1586-W.

CIVIL ENGINEER, M.E.I.C., age 41, interested in position as Project Manager or Chief Engineer. Sixteen years of experience in field and office covering design and construction of large building projects, surveys, bridges, roads, dams, and particularly Hydro Electric power projects. Capable of taking complete charge of design and construction. Apply to File No. 1751-W.

Wanted Immediately SENIOR TOOL DESIGNERS

We now have several openings for tool designers of senior quality. The men required should have not less than 10 years' experience in general tool designing in addition to a basic training of 3-5 years at tool and jig-making. Experience in tooling for the automotive or aero-engine production industry a decided asset.

These positions call for top flight men with initiative and creative ability, and who are capable of directing others for the tooling of a large project — "Location Toronto Area". In response, please provide full particulars on age and academic record: also names and addresses of previous employers, together with the length of service and nature of work performed: also salary expected. Replies will be treated in confidence. Apply to File Number 1160-V.

ACTIVE PARTNERSHIP desired with a firm of General Building Contractors located in Montreal or would be interested in forming new company with one or more construction engineers. Advertiser has capital and 20 years of construction experience. For additional information, apply in confidence to File No. 2138-W.

INDUSTRIAL AND CIVIL ENGINEER, M.E.I.C., P.Eng., Que. B.A.Sc. Age 40. Married. Fluently bilingual. Seeks position as Industrial Engineer, Executive Sales Engineer, Town Engineer, experience in motion and time study, methods, process, development, production control, costing, plant maintenance, highway engineering, municipal engineering, sales. Available on short notice. Apply to File No. 2157-W.

GRADUATE ENGINEER, M.E.I.C., McGill Chemical Engineering 1935. Six years experience in plant operation, four

Building Research

Engineers and Architects interested in the application of research to building and associated engineering problems are invited to enquire about employment possibilities with the newly formed Division of Building Research of the National Research Council. An enquiring mind is an essential; experience in building work in Canada is really necessary; bilingualism would be helpful. Salaries depend upon training and experience; opportunities for useful work are unlimited. Enquiries should be addressed to the Director, Division of Building Research, National Research Council, Ottawa.

MANAGER OF MANUFACTURING

required by Canadian mill producing 500 tons per day of Specialty Papers, Tissues, Paperboard and Newsprint. Position requires proven managerial ability and technical qualifications for the production of paper. The location is most desirable and salary attractive. Applications giving all essential information will be kept confidential if desired — and should be addressed to

File No. 1140-V.

Professor of Electrical Engineering

Applications are invited by the University of Manitoba for the post of Professor and Chairman of the Department of Electrical Engineering which becomes vacant on Sept. 1, 1949, on the retirement of Dr. E. P. Fetherstonhaugh. Commencing salary will depend on candidate's qualifications.

Full information regarding candidate's age, academic and professional record and other qualifications with names of three references and a recent photograph should be submitted with the application not later than May 23rd, 1949 to THE REGISTRAR OF THE UNIVERSITY OF MANITOBA, WINNIPEG, MAN., from whom further particulars may be obtained.

years in the R.C.A.F., aeronautical engineering and four years in business and industrial consulting. Desire responsible position in Quebec or Ontario. Apply to File No. 2228-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. (Alta.). Age 29. B.Sc. Married. Presently employed. Experience in light commercial construction and housing projects. Familiar with project planning and utility layouts. Have organized and supervised several large construction projects, have good background in lumber and building supply business relative to the construction industry. Some experience in highway location and construction, sewer and water distribution and natural gas installation. Interested in partnership with consultant engineer or architect, or position with progressive construction firm, would consider oil company. Home Edmonton, Alberta. Apply to File No. 2521-W.

PARTNER wanted by engineer, M.E.I.C., with 25 years experience, contemplating private practice. Must have necessary qualifications; previous experience with consulting engineer desirable. Apply to File No. 2642-W.

GRADUATE CIVIL ENGINEER, M.E.I.C., P.E.Q., with seven years intensive work with large pulp and paper mill, construction, maintenance, estimate, layouts, process development, time study, etc., also experience in public work-management; water, sewer, electric system generation, transmission and distribution with full responsibilities of design and work, etc. Services available at short notice. Age 32. Married and bilingual. Apply to File No. 2823-W.

ENGINEERING PHYSICIST, Jr.E.I.C., Sask. '47, age 24, Prof. Eng. Ont. Single. Desires research work in progressive company. Preferably in Ontario or West. Experience includes six months outside plant of Bell Telephone, Montreal. 14 months ass't Engineer with Miniature Electric Motor Manufacturing Company. Duties are research and test of design and materials plus plant control and maintenance. Presently employed, available one months notice. Apply to File No. 2917-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc. Queen's. Age 32. Married. Veteran. Navy Engineer Officer. Experience primarily includes heating and power plant design, estimating construction and maintenance. At present employed but desires change to responsible position in Ontario, British Columbia or Alberta. Apply to File No. 3020-W.

GRADUATE MECHANICAL ENGINEER, A.M.I.M.E., fully qualified, age 34, educated on the continent and in England with extensive experience in layout, design and manufacture of handling machinery requires post with expanding organization. Available shortly. Apply to File No. 3021-W.

MECHANICAL ENGINEER, M.E.I.C., Prof. Eng. (Quebec) 15 years of shop practice in maintenance and locomotive repair; 5 years machinery design, including welded vessels, process piping and pulp mill layout. Seeking responsible position preferably in Montreal area. Available on short notice. Apply to File No. 3045-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng.,Q.,G.I., Mechanical E., A.M.I. Loco., E., (Great Britain). Aged 30. Married. 6 years locomotive design and construction, machine shop production and assembly. 5½ years Engineer Officer, Royal Air Force—rank Squadron Leader, Chief Technical Officer. Employed 2 years in Province of Quebec. Desires change to position with more responsibility and opportunity for advancement. Preferably Southern Ontario and Western Canada. Apply to File No. 3059-W.

SALES ENGINEER, M.E.I.C., retired Naval Officer, mechanical and electrical background. Experienced in sales and running branch office. Four years with wartime shipbuilding, 2 years with War Assets Corporation in technical and executive capacity. At present in marine and engineering supply sales. Interested in permanent position in Montreal area. Apply to File No. 3081-W.

MECHANICAL ELECTRICAL ENGINEER, S.E.I.C., graduating in May from Ecole Polytechnique seeks position with progressive industrial firm. Age 26, single. Good mechanical background. Employed during war with National Research Council. Ambitious, with good character and potentialities. Apply to File No. 3083-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc. Prof. Eng. Age 33. Married no children, bilingual, seven years experience in the following fields: one year in hydro-electric power house operation, three years planning and supervision in shipbuilding, two years in design and supervision of irrigation works; one year as Construction Engineer in charge of the construction of a dam. Available in June 1949. Presently employed in Ceylon. Apply to File No. 3085-W.

CHEMICAL ENGINEER, Jr.E.I.C., B.Sc. Queen's '46, Professional Engineer (New Brunswick) age 26, married. Reliable and conscientious. Experience includes product control, piping layout and general engineering in Pulp and Paper and Petroleum Industry. Also held responsible position in sanitary engineering field as district engineer-in-charge. Desires responsible position in industry or with consulting engineer. Available immediately. Apply to File No. 3092-W.

PROFESSIONAL ELECTRICAL ENGINEER, A.M.I.E.E., seeks position where expert knowledge of motor control gear, motors, switchgear, cables etc. is required. Wide experience in applications, field and makers tests, layout, specifications, purchase and installation of controls. Would consider engineer-representation of reputable firms. Apply to File No. 3095-W.

CIVIL ENGINEER, S.E.I.C., E.I.T. (B.Sc. Alta.), age 29. Married. Presently employed in construction supervision design and estimating. Experienced in highway and municipal works, surveys and layout. Four and one-half years overseas artillery survey experience. Desires a permanent position with a consultant or other engineering firm in Western Canada. No objection to travel in connection with field work. Available on reasonable notice to present employer. Apply to File No. 3106-W.

MECHANICAL ENGINEER, M.E.I.C., age 35, married, excellent health. Four years practical mining experience, three years woods operations. Presently employed in woods mechanization program. Three years army experience, automotive repair and maintenance. Desires work in maintenance, or sales and supervision of field installations, testing and making estimates. Apply to File No. 3115-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Eng. (McGill) 1944. Married, 26 years of age, one child. Army service in R.C. Signals. Post-graduate training in Radio Physics at the University of Western Ontario. At present employed as Assistant Professor of Physics at a Maritime University. Interested in research or development in radio, electronics or allied fields. Preferably Montreal or Ottawa area. Apply to File No. 3127-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., Toronto. Veteran, age 27. Married, graduating this spring, desires employment commencing about May 1st. Will consider anything, but primarily interested in reinforced concrete and structural steel design work in Southern Ontario. Apply to File No. 3128-W.

CIVIL ENGINEERING STUDENT, S.E.I.C. Graduating in May, 1949, from University of British Columbia. Age 23, married, veteran. Experience limited to survey work. Desires experience with a consultant or with large design and construction company. Available after May 15th, 1949. Apply to File No. 3129-W.

GRADUATE ENGINEER, Jr.E.I.C., age 32, married, desires position leading to increased responsibility in railway or its equivalent field. B.Sc. Eng. (Electrical) University of Manitoba ('44), two years Engineer Officer Royal Canadian Navy operating and repair of steam turbines and diesel electric generators, nine years railway machine shop, one year detail and design of welded pressure vessels, steam generators. One winter a lecturer in mechanical engineering. One year in railway signal engineering on signal layout, installation, circuit design. Apply to File No. 3130-W.

MECHANICAL ENGINEER, Saskatchewan, 1946, Jr.E.I.C., married, age 25. Presently located in Winnipeg area, desires permanent position in industrial or plant engineering. Experience includes teaching, construction, sales, equipment design and installation. Available May 1st, 1949. Apply to File No. 3131-W.

EXECUTIVE, M.E.I.C., B.A.Sc., P.Eng. Wide managerial experience in all phases of development, production, sales, organization, cost control. Age 39. Married, family. Willing to consider position with established concern requiring senior executive. Apply to File No. 3138-W.

MECHANICAL ENGINEER, Jr.E.I.C., (B.Eng., McGill, '47) one year experience in design and draughting and some construction work. Presently completing professional course in Industrial Relations. Interested in becoming established with industrial firm to do time study work, job evaluation, wage incentive plans, personnel supervision etc., where background of engineering could be useful. Some knowledge of French. Area of Ontario, Quebec or B.C. Available on month's notice. Apply to File No. 3149-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc.(E.E.), U.B.C. 49, married, age 33. Electrical experience with R.C. Signals (overseas 6 yrs.) Desire employment in power or electronics. Available 1 May, 1949. Apply to File No. 3154-W.

ELECTRICAL ENGINEER, M.E.I.C., I.E.G., Prof. Eng. Quebec. Age 35. Several languages spoken fluently. Married, no children. Extensive practical experience in plant maintenance and trouble shooting, seeks resident position with industrial firm, available at short notice. No objection to go to country. Apply to File No. 3155-W.

ELECTRICAL ENGINEER, S.E.I.C., recent graduate of Nova Scotia Technical College, married, five summers' pre-graduation experience plant electrical maintenance, desires employment in Montreal area, preferably in design, testing, or small-scale production of electronic or communications equipment. Apply to File No. 3156-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C., Canadian, 29 years of age, married, one child. Seven years varied experience mostly with one employer, in general machine-shop, foundry, drafting, process and mining industries. At present assistant mechanical superintendent of mining concern in South America. Returning to Canada in June. Desire position, preferably in Canada or the U.S.A. Apply to File No. 3157-W.

ELECTRICAL ENGINEER, S.E.I.C., S.A.I.E.E., age 23, married, B.Sc. '48 from University of New Brunswick, at present taking one year post graduate work at the University of London on Beaverbrook Overseas Scholarship. Summer vacations spent in the Power & Paper Industry. Returning to Canada early in September. Apply to File No. 3161-W.

GRADUATE ENGINEER, M.E.I.C., with broad administrative experience in manufacturing. Responsibilities have included development of national sales organization, planning of national advertising campaign, purchasing for light metal manufacturing plant, product promotion and development, patents and cost accounting. Youthful, aggressive, dependable and loyal. Widely traveled. Complete personal file available. Apply to File No. 3162-W.

GRADUATE MECHANICAL ENGINEER (McGill), M.E.I.C. P.Eng. Que., married, bilingual, five years sales experience in heavy plant and contracting equipment in Province of Quebec. Responsibilities include sales promotion, sales engineering in regards to steam and electrical equipment and pumps, supervision of installations and recommended maintenance schedules. Some experience in electrical installations, welding and surveying. Desires position of responsibility with progressive firm, not necessarily in sales. No locality preference. Presently employed. Apply to File No. 3163-W.

MECHANICAL ENGINEER, M.E.I.C., McGill 1942, age 28, presently engaged as design, sales and construction engineer with small company manufacturing and installing heavy industrial machinery, demand for which is falling off due to heavy oil production. Has had experience, RCEME Overseas, steel designing and detailing. Would consider any employment offering interesting problems, responsibility and future promotion. Apply to File No. 3164-W.

EMPLOYMENT

FOR

STUDENTS

The Institute is anxious to help Student Members who are seeking summer employment.

Employers are requested to advise the Employment Service of the Institute as to any vacancies they may have.

Address all information to:

THE EMPLOYMENT SERVICE

THE ENGINEERING INSTITUTE OF CANADA

2050 MANSFIELD ST.

MONTREAL 2, QUE.

NEWS OF THE BRANCHES

(*Continued from page 237*)

shorter than the existing one, provisions have been made for twelve drop sections. These will be of boulder and quarry rock construction.

On the embankments, service roads will be constructed to serve bordering properties and to provide facilities for channel maintenance. One new railway bridge and several highway bridges will be required.

In conclusion Mr. Carruthers stated that the Provincial and Dominion Governments had given their approval, provided funds and instructed that the work proceed. It is estimated that the total cost will be $2,400,000.

Winnipeg

G. W. Moule, M.E.I.C.
Branch Secretary

Electrical Section

J. C. Pratt, M.E.I.C.
News Editor

At the monthly meeting of the Engineering Institute's Electrical Section held March 3, Clayton H. Glenn, spoke on the subject of **The Electrical System of the North Star Airliner.** Mr. Glenn is special assignments engineer with Trans-Canada Air Lines, with whom he has been employed for the past six years.

The electrical system in the aircraft was traced from the four 24 volt d-c generator sources to the myriad of instruments and mechanisms used throughout the craft. Mr. Glenn mentioned the continual weight reductions being made in generating equipment and cited the postwar figure of seven pounds per kilowatt. The various items of electrically operated or controlled equipment were explained, and the descriptions proved to be of considerable interest to all present. Some idea of the extent and complexity of electrical equipment can be given by mention of the fifteen miles of wire which is necessary to interconnect the many units. The cost of this equipment is in the neighborhood of $150,000 per plane.

A lively discussion kept Mr. Glenn busy for some time following his address, after which the meeting adjourned for refreshments.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEWS

METALLIC CORROSION PASSIVITY AND PROTECTION, 2nd ed:

U. R. Evans, with Appendix by A. R. Winterbottom. London, Arnold; Toronto, Longmans Green, 1948. 863 pp., illus., 9¼ x 6 in., cloth, $14.00 (in Canada).

This new edition has been largely rewritten. An introduction dealing with the principles of electrochemistry has been inserted in place of the long footnotes in the previous edition. Each chapter is divided into three parts, one devoted to the scientific basis of the subject, one dealing with practical problems, and a third presenting a quantitative treatment.

The book includes simple examples of corrosion and passivity; study of thin films; oxidation at high temperatures; corrosion in moist or polluted atmospheres; corrosion not involving the absorption of oxygen; corrosion of ferrous materials involving the absorption of oxygen; corrosion of non-ferrous materials involving the absorption of oxygen; influence of stress, strain and structure; influence of contacts and crevices; protection by inhibitive treatment of water; protection by chemical and electrochemical treatment; protection by paints and enamels; protection by metallic coatings; and testing. An appendix deals with optical methods for the determination of films on metals based on polarization and interference phenomena.

The book has been provided with extensive indices and bibliographic references. J.D.

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS. PAPERS:

Magnetic Amplifiers, *A. G. Milnes.*

Discussion of transductor behaviour on short-circuit; the effect of permeability on the performance with self-excitation; the arrangements of transductors to give duo-directional magnetic amplifiers; fundamental design principles relating power output, amplification and time lag with supply frequency, core area and self-excitation.

Oscillograph for Automatic Recording of Disturbances on Electric Supply Systems, *W. J. T. Atkins.*

Describes a fully automatic oscillograph in which 15 CRO tubes, housed in a common camera, may be photographed side-by-side on a common 70 mm film. Any abrupt supply voltage change influences a detector initiating the CRO beams and starting a film driving motor. Recording equipment is capable of giving detailed service records of modern high speed switchgear and protection.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Basic Electrical Engineering for Students of Electrical Engineering:
G. F. Corcoran. New York, Wiley; London, Chapman and Hall, 1949. 449 pp., illus., cloth.

Computation Curves for Compressible Fluid Problems:
C. L. Dailey and F. C. Wood. New York, Wiley; London, Chapman and Hall, 1949. illus., paper.

Design of Steel Buildings, 3rd ed:
H. D. Hauf and H. A. Pfisterer. New York, Wiley; London, Chapman and Hall, 1949. 280 pp., illus., cloth.

Earth Conduction Effects in Transmission Systems:
E. D. Sunde. New York, London, Toronto; Van Nostrand, 1949. 373 pp., illus., cloth. (Bell Telephone Laboratories Series).

Elements of Mechanical Vibration, 2nd ed:
C. R. Freberg and E. N. Kemler. New York, Wiley; London, Chapman and Hall, 1949. 227 pp., illus., cloth.

How to Maintain Electric Equipment in Industry:
General Electric Co., Schenectady, N.Y., 1944. 372 pp., illus., cloth.

Industrial Electricity, Volume Two— Alternating-Current Practice:
W. H. Timbie and F. G. Willson. New York, Wiley; London, Chapman and Hall, 1949. 781 pp., illus., cloth.

Radio Amateur's Handbook, 26th ed:
American Radio Relay League, West Hartford, Conn., 1949. 617 pp., illus., paper.

Sewerage Design and Specification:
L. B. Escritt. London, Contractors Record and Municipal Engineering, 1947. 293 pp., illus., cloth.

Soil Mechanics for Civil Engineers:
B. H. Knight. London, Arnold, 1948. 255 pp., illus., fabrikoid.

Twenty-Five Years; a Record of the Origin, Progress and Achievements of the Electricity Supply Commission, Union of South Africa, 1923-1948:
Electricity Supply Commission, Johannesburg, 1949. 63 pp., illus., cardboard.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Bank of Canada:
Annual Report to Minister of Finance and Statement of Accounts for the Year 1948.

Canadian Almanac and Directory, 102nd ed:
Copp Clark, Toronto, 1949.

Corporation of Professional Engineers of Quebec:
Report of the President and Council for the Year 1948 together with Auditor's Report and Financial Statement.

Engineering and Industrial Catalogue, 14th ed, 1948-49:
Canadian Engineering Publications, Montreal, 1949.

Metropolitan Water District of Southern California:
Report for the Fiscal Year, July 1, 1947 to June 30, 1948.

Toronto Harbour Commissioners:
Annual Report, 1948.

TECHNICAL BULLETINS, ETC.

American Institute of Mining and Metallurgical Engineers. Technical Publications:
No. 2454—Effect of Hydrogen on the Ductility of Cast Steels, C. E. Sims, G. A. Moore, and D. W. Williams.

LIBRARY REGULATIONS

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Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

Non-members may consult the library, but may not borrow material.

Canada. Bureau of Mines. Memorandum Series:

No. 102—Gasoline Survey for Summer, 1948, P. B. Seely and F. E. Goodspeed.

...Bureau of Statistics. Mining, Metallurgical and Chemical Section. Publications:

Iron and Steel and their Products in Canada, 1943-45.

Edison Electric Institute. Publications:

No. Q-10—Cable Operation, 1946.

Institution of Electrical Engineers. Proofs:

Direction-Finding Site Errors at very high Frequencies, H. G. Hopkins and F. Horner.—Measurement of Light and Colour, G. T. Winch.—Railway Traction Control.—Equipment on Suburban London Transport, E. Webster.—Scattering of Radio Waves by Metal Wires and Sheets, F. Horner.—Selection of Transformers for Use in Distribution Networks, with Special Reference to the New Low-Voltage Standard of 240 Volts, E. Tobin.—Testing, Reconditioning and Servicing of Domestic Appliances, H. Hobbins.—Tidal Power and the Severn Barrage, H. Headland.

Institution of Mechanical Engineers. Advance Copies:

Application of Free Jets to the Mixing of Fluids in Bulk, H. Fossett and L. E. Prosser.—Influence of Valve Port Design on the Volumetric Efficiency of the Compression—Ignition Engine, C. B. Dicksee—Investigations into Cyclone Dust Collectors, A. J. ter Linden.—Marine Boiler Deterioration, I. G. Slater and N. L. Parr.—Marine Engineering in the Royal Navy: a Review of Progress during the last Twenty-five Years, Vice-Admiral Sir John Kingcome.—Reciprocating Seals, F. H. Towler.—Rotary and Oscillating Seals, T. E. Beacham.

International Civil Aviation Organization. Publications:

Abbreviations of Place Names, January 1949 (Doc 6314-COM/509).—ICAO Regional Manual—North Atlantic (Doc 4500) Amendment No. 30, February 23, 1949.

North-East Coast Institution of Engineers and Shipbuilders. Advance Copies:

Production of Forgings for Marine Purposes, R. C. Benson.—Propeller Blade Vibrations, W. L. Hughes.—Underwater Propeller Vibration Tests, L. C. Burrill.

Ohio State University. Engineering Experiment Station. Bulletin:

No. 135—Experiments on Belt-Drive Fundamentals, C. A. Norman.

Society of the Plastics Industry. Publications:

Basic Chemistry of the Polyester Laminating Resins, E. M. Beavers.—Decorative Surfacing of Reinforced Laminates, T. W. Noble.—Manufacture and Properties of Plastic Surfaced Plywoods, B. G. Bull.—Molded Finishes, C. E. Bacon.—Organic Peroxides as Catalysts for Polyester Type Resins, C. H. Ryholt and T. C. Swigert.—Silicones, New Engineering Moterials, R. W. Kolderman.—Surface Coatings for Reinforced Plastics, P. O. Blackmore.

STANDARDS, SPECIFICATIONS, ETC.

British Standards Institution. Standards:

BS 387:1948—Attachment and Drive of Circular Metal Cutting Saws for Cold Working. — BS 590:1949 — Electrically Welded Mild Steel Chain; Short Link and Pitched or Calibrated for Lifting Purposes.—BS 1449:1948—Steel Plate Sheet and Strip—Addendum No. 1: Dec. 1948.—BS 1488:1948—Test-Films for 16mm Cinematograph Projectors.—BS 1498:1948—Gear Hobbing Machines for Turbine and Similar Drives.—BS 3006:1949—Dimensions of Ship's Stud Link Anchor Cables.

Canadian Standards Association. Specifications:

CSA Z91-1949—Code of Practice for Window Cleaning.

Edison Electric Institute. Specifications:

TD-7, 1948—Specifications for Spool Type Secondary Racks.

PAMPHLETS, ETC.

Aluminium and its Alloys:

S. A. J. Sage. Manchester, Emmott, 1948. (Mechanical World Monographs No. 50).

Canada Today:

E. H. Gilpin. London, Gauge and Tool Makers' Association, 1949.

Engineering Aspects of Cove Lighting Design:

L. C. Brown and J. R. Jones. New York, Illuminating Engineering Society, 1948.

Exports to Canada; Report of the United Kingdom Engineering Mission, 1948:

His Majesty's Stationery Office, London, 1949.

History of the International Scientific Management Movement:

Canadian Management Council, Montreal, 1949.

Looking Ahead in the Fuels Supply:

R. A. Sherman. (Reprinted from Coal-heat, December 1947).

Northwest Territories; Administration—Resources—Development:

Northwest Territories and Yukon Services, Ottawa, 1948.

Official Statement and Explanation of Flood Emergency Legislation:

B. I. Johnson. Victoria, B.C., King's Printer, 1948.

Outline of Advertising for Engineers:

J. W. B. Tunstall. Manchester, Emmott, 1948. (Mechanical World Monographs No. 52).

Outlook for Women in Architecture and Engineering:

U.S. Dept. of Labour Women's Bureau, Washington, 1948. (Women's Bureau Bulletin Bo. 223-5).

Performance of Residential Chimneys:

L. B. Schmitt and R. B. Engdahl. Pittsburgh, Bituminous Coal Research, Inc. 1948.

Règles d'Utilisation des Ronds Crénelés et Lisses pour Béton Armé de Limite d'Elasticité Supérieure ou Egale a 40 kg/mm²:

Institut Technique du Bâtiment et des Travaux Publics, Paris, 1948.

Snow and Ice Control in Cities over 200,000 Population:

American Public Works Association, Chicago, 1949. (Public Works Engineer's Special Report No. 6).

Statistical Department in the Steel Industry:

A. W. Swan. London, Royal Statistical Society, 1948.

What Good are Standards?

American Standards Association, New York, 1949.

BOOK NOTES

The Institute does not assume responsibility for any statements made; these are taken from the preface or thet ext of the book.

Prepared by the Library of The Engineering Institute of Canada.

BRITISH STANDARDS INSTITUTION. STANDARDS:

British Standards Institution, London.

Steel Plate, Sheet and Strip. BS 1449:1948. 2/6-.

This British standard is an extension of, and should be regarded as a companion to BS 970, to provide more fully for the steels that are commonly supplied in the form of plate, sheet and strip.

Structural Steel. BS 15:1948. 2/-.

The standard specifies process of manufacture, test methods and requirements, permissible margins on weights and dimensions, marking, provision of test certificates and inspection procedures. Tests on manufactured rivets are also described.

Use of Structural Steel in Building. BS 449:1948. 6 -.

This British standard relates primarily to the use of structural steel in building. The requirements of the standard shall be deemed not to apply to structures fabricated from steel tubes, which will be covered by an addition to this standard (in course of preparation), nor to structures fabricated from light gauge sheet and strip steel.

CANADIAN STANDARDS ASSOCIATION. SPECIFICATIONS:

Z7.1 Series-1948—Specifications for Motion Picture Photography. $2.50. Ottawa, the Association. 1948.

The purpose of these specifications is to cover the performance characteristics of equipment and materials and certain other matters such as methods of designating relative apertures, shutter speeds

and emulsion speeds, physical definitions, and preferred processes or practices. Dimensional standards are also important since certain materials such as films and plates are intended for use with similar equipment produced by different manufacturers.

INDUSTRIAL HEALTH REVIEW:

Dept. of National Health and Welfare, Industrial Health Division, Ottawa, January 1949. Semi-annual. Free.

This new bulletin will deal with such topics as: current industrial health activities in Canada and abroad; research projects in industrial health; new toxic materials used in industry; unusual uses of old materials; information on morbidity, mortality and health services in industry; notification of refresher and advanced courses in industrial medicine and hygiene; abstracts of articles which have had a limited circulation, and other metarial of interest and value to the readers.

NATURE OF A PATENTABLE INVENTION; ITS ATTRIBUTES AND DEFINITION, 2d ed:

J. E. R. Hayes. Cambridge, Mass., Addison Wesley, 1948. 187 pp., illus., 9¼ x 6 in., cloth, $5.00.

The author attempts to arrive at a means of deciding whether an invention is patentable or not. The subjective analysis of an invention has the following advantages: the mind is directed to the essential invention as being the principal factor, and an entity in itself; an approach to the patent law is provided that will admit of more general principles and broader generalizations.

REPORT ON THE WORK CARRIED OUT IN THE "PANEL" OR "RADIANT" HEATED TEST BUILDINGS AT THE NATIONAL RESEARCH COUNCIL LABORATORIES, OTTAWA, DURING THE WINTER, 1947-1948:

C. D. Niven. National Research Council, Ottawa, 1948. 20 pp., illus., 10¾ x 8¼ in., paper, 25c. (N.R.C. Publication No. 1791).

Conditions were investigated in a test building heated alternatively by radiators and by floor or wall panel heating. More heat can be obtained from a heated floor than is usually assumed, provided the floor be heated right up to the edge. Great improvement in comfort can be effected by use of ceiling ventilation when the room is overheated due to solar radiation. Insulation on the walls and also around the perimeter of a concrete floor slab lying right on the ground is important in maintaining comfortable conditions.

STUDY OF ENGINEERING REGISTRATION LAWS:

A. M. Sargent. Detroit, the author, 1948. 60 pp., illus., 8½ x 5½ in., paper, 75c.

This discussion of engineering licensing laws was written to present to the engineering profession, and to all of those whom it affects, a clear picture of the licensing situation. It is the purpose of the booklet to objectively examine the public necessity for registration laws, to call attention to the effects strict enforcement would have upon the industry and society in general, to discuss the general requirements of the laws and to point out some of the potentially dangerous practices open to administrative officials who are granted broad and vaguely-defined powers.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

AERIAL PHOTOGRAPHY IN URBAN PLANNING AND RESEARCH:

M. C. Branch, Jr. Harvard University Press, Cambridge, Mass., S. J. Reginald Saunders, Toronto, 1948. 150 pp., illus., diagrs., charts, maps, tables, 11 x 8½ in., paper, $3.75 in Canada. (Harvard City Planning Studies, XIV.)

Part I, on the use of spiral photographs, discusses the effective types, the methods of photographic mapping, and the cost of aerial surveys. Part II deals with the special knowledge prerequisite to the effective use of air photos, including information on photoruns and plotting mosaics, flight planning, equipment, and photographic interpretation.

CIVIL ENGINEERING.

V. C. Whiting and K. Mills. Longmans, Green and Co., New York, London, Toronto, 1948. 152 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $3.50 in Canada.

This book is designed to give the man who already has the practical experience, the necessary technical knowledge for a supervisory position in civil engineering works. It will give him an understanding of plans, detail drawings, quantities, and specifications, and will teach him to keep records. Materials and plant are dealt with, and a special chapter is devoted to concrete.

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS, 2d ed:

J. L. Alden. Industrial Press, New York, 1948. 252 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $3.50.

This book describes how to design, build or buy an exhaust system that will meet the requirements of law or of industrial hygiene. It includes exhaust ventilation, low pressure pneumatic conveying, design of hoods and piping, and structural details, as well as the selection of dust separators, centrifugal and axial flow fans. Two new chapters on hoods for fumes and on axial flow fans, as well as lesser additions, are included in this new edition.

ELASTICITY AND ANELASTICITY OF METALS.

C. Zener. University of Chicago Press, Chicago, Illinois, 1948. 170 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

Of interest to physicists, metallurgists and engineers, this book presents the science of the nonelastic behavior of metals at low stress levels. It considers the various types of anelasticity and develops their interrelations. A review is given of the various types of relaxations which have been found to give rise to anelasticity, and also of the dependence of the elastic properties of a metal upon its microstructure. Over 200 references are cited. The author points out the role which studies of this behavior will play in the future development of metallurgical science.

FUEL AND THE FUTURE.

Great Britain, Ministry of Fuel and Power. His Majesty's Stationery Office, 429 Oxford Street, London, W.1, England, 1948. 3 vols., diagrs., charts tables, 9½ x 6 in., paper. 3s.6d.

Vol. I of this report of an officially convened conference deals with the generation of steam, steam utilization, and heat for drying. Vol. II covers high temperature processes, the carbonization and chemical industries, and several special industrial sessions. Vol. III presents modern heating in relation to the architect and fuel services in the home. Two simultaneous joint sessions on district heating and the sizing and grading of coal are also included.

HANDBOOK OF REFRIGERATING ENGINEERING, 3d ed:

W. R. Woolrich and L. H. Bartlett. D. Van Nostrand Co., New York, London, Toronto, 1948. 730 pp., diagrs., charts, tables, 7½ x 5 in., cloth, $10.50 in Canada.

Beginning with fundamental units, primary refrigerants, and charts and tables of thermodynamic characteristics, this handbook continues with detailed descriptions of refrigerating equipment and processes. Special adaptations to ice making, quick freezing, freezer storage, air cooling, and marine refrigeration, are dealt with separately. Lubrication, instruments and controls, piping details, and safety measures are also discussed. The extent of revision in the present edition is indicated by the more than 300 additional pages.

HIGH-POLYMER PHYSICS. A SYMPOSIUM,

Edited by H. A. Robinson. Chemical Publishing Co., Remsen Press Division, Brooklyn, New York, 1948. 572 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $12.00.

Thirty-nine physicists and chemists, all prominent experts in their special fields, contributed to this symposium.

The individual articles are devoted to the molecular structure, physical and physico-chemical properties of natural and synthetic high polymers. The last part deals with scientific instruments used for making determinations and carrying out tests. There is a bibliography at the end of each chapter.

INSTALLATION AND SERVICING OF LOW POWER PUBLIC ADDRESS SYSTEMS.

J. F. Rider, Publisher, 480 Canal St., New York, 1948. 208 pp., illus., diagrs., charts, tables, 7¾ x 5½ in., cloth, $1.89.

Stressing practical facts and ideas, this book deals with the installation and servicing of low power public address systems. It opens with a discussion of the fundamentals of sound and pertinent acoustical problems. This is followed by an explanation of devices used as inputs to an amplifier. Various types of audio amplifiers are considered as well as the important subject of impedance matching. Problems of installation and trouble-shooting are presented with typical examples.

INTRODUCTION TO GAS-TURBINE AND JET-PROPULSION DESIGN.

C. A. Norman and R. H. Zimmerman., Harper & Brothers, New York, 1948. 286 pp., illus., diagrs., charts, tables 9½ x 6 in., cloth, $5.00.

Designed for the beginner in the field, this volume deals with gas turbines for stationery, aircraft, marine, and locomotive plants, and also with rockets. It goes thoroughly into both the performance and design of gas turbine and jet propulsion apparatus. Well illustrated, it includes nearly 200 figures, performance graphs, and photographs.

MICROWAVES AND RADAR ELECTRONICS.

E. C. Pollard and J. M. Sturtevant. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 426 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., linen, $5.00.

In this book, a physicist and chemist have presented the postwar development and the peacetime applications of radar. After surveying the field, the special knowledge of electricity and magnetism necessary to an understanding of microwaves is outlined. Discussed in detail are the significance of microwaves and radar electronic techniques in physical and chemical research. Much attention is devoted to the applications considered in scientific literature since the end of the war.

PACKAGING METHODS AND EQUIPMENT.

O. W. Roskill & Co. (Reports) Ltd., 14 Great College Street, London, S.W.1, March, 1948. 57 pp. plus Appendices, 14 pp., 14 in. x 9¾ in., stiff paper, 30 s.

Following an historical sketch, this mimeographed report describes the various types and methods developed for shipping containers, liquid packages, solid packages, finishing and handling equipment, and special forms of packaging. A list of British manufacturers of packaging materials and equipment is appended.

PRESTRESSED CONCRETE.

G. Magnel. Concrete Publications, Ltd. 14 Dartmouth St., Westminster, London, S.W.1, 1948. 215 pp., illus., diagrs., charts, tables, 9¾ x 6½ in., linen, 15s.

This book describes the principles and practice of building with prestressed concrete. A notable feature is the simplicity of the design methods which allow for the various losses of prestress. Different methods of inducing a compressive stress are discussed. Statically-indeterminate structures, continuous beams with equal spans, numerous tests, and practical applications are all considered. The notation is similar to that used in Britain for ordinary reinforced concrete with such additional symbols as required.

PRINCIPLES OF ELECTRIC AND MAGNETIC FIELDS.

W. B. Boast. Harper & Brothers, New York, 1948. 405 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $4.75.

This textbook is designed for study by undergraduate students desiring a fundamental comprehension of electric and magnetic fields. Parts I and II provide an introduction to basic concepts, and Part III treats important supplementary aspects of the subject. No knowledge of electric circuits is presumed in Parts I and II, such concepts are developed as they are needed. The book is written in the MES system of units, and a knowledge of calculus is necessary. Examples are used freely as a means of applying theory to practical engineering problems.

RADIO ENGINEERING, Volume I.

E. K. Sandeman. John Wiley & Sons, New York, 1948. 775 pp., diagrs., charts, tables, 9 x 5½ in., cloth, $6.50.

Originally planned as instructions for maintenance engineers at B.B.C transmitting stations, this book is designed to give beginners in radio the working principles they need. It is also a reference volume for experienced engineers and designers of radio circuits and equipment. A working knowledge of elementary algebra and logarithms is needed. Practical ends are stressed, either in the form of technical facts, designs or methods or else in the form of essential formulas.

SYMPOSIUM ON INTERAL STRESSES IN METALS AND ALLOYS.

Institute of Metals, 4 Grosvenor Gardens, London, S.W.1, England, 1948. 485 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 42s. (Monographs and Report Series No. 5).

Of interest to mechanical and metallurgical engineers, this symposium contains thirty-six papers grouped under three main headings: the measurement of internal stresses; the origin, control and removal of internal stresses; effects associated with internal stresses, both on the microscopic and the microscopic scale. A wide variety of metals and conditioning is covered in the separate papers. Over one hundred pages of technical discussion of the papers presented have been appended.

TECHNICAL WRITING.

K. Hendricks and L. A. Stoddard. Utah State Agricultural College, Logan, Utah, 1948. 117 pp., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $1.50.

This book is designed as a text for the student in technical writing and as a quick reference manual for the experienced research worker. Every phase of research writing with the exception of sentence and paragraph construction is included. Emphasis is placed upon the gathering of material, the collecting of data and the handling of illustrations, foot notes, and cross references. Methods of exploring a field and recording the findings are considered.

TOOL STEEL SIMPLIFIED, rev. ed.

F. R. Palmer and G. V. Luerson. Carpenter Steel Company, Reading, Pa.; Williams & Wilson, Montreal, 1948. 564 pp., illus., diagrs., charts, tables, 9 x 6 in., cloth, $12.00, U.S.A.; $2.50 elsewhere.

Intended for the man who makes tools, this handbook of modern practice, presents in simple and accessible form the technical and metallurgical knowledge possessed by the steel expert. Outstanding features are sections on the selection of tool steel for each kind of tool, the properties, heat treatment and testing of tool steel, and other practical information. In this revised edition, new methods, new terms, and new principles are included. Tool-steel types are based on the "matched-set" classification developed by the Company.

VACUUM MANIPULATION OF VOLATILE COMPOUNDS.

R. T. Sanderson. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 162 pp., diagrs., tables, 8½ x 5½ in., cloth, $3.00.

Of interest particularly to the investigator without special training in the field, this book provides a firm foundation for working with high vacuum apparatus. It supplies all the data necessary for the construction and operation of such apparatus. The appendix includes reference material on instruments used in this type of research and on almost 400 compounds conveniently studied by the described procedures.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

ASM REVIEW OF METAL LITERATURE, Volume 4, 1947.

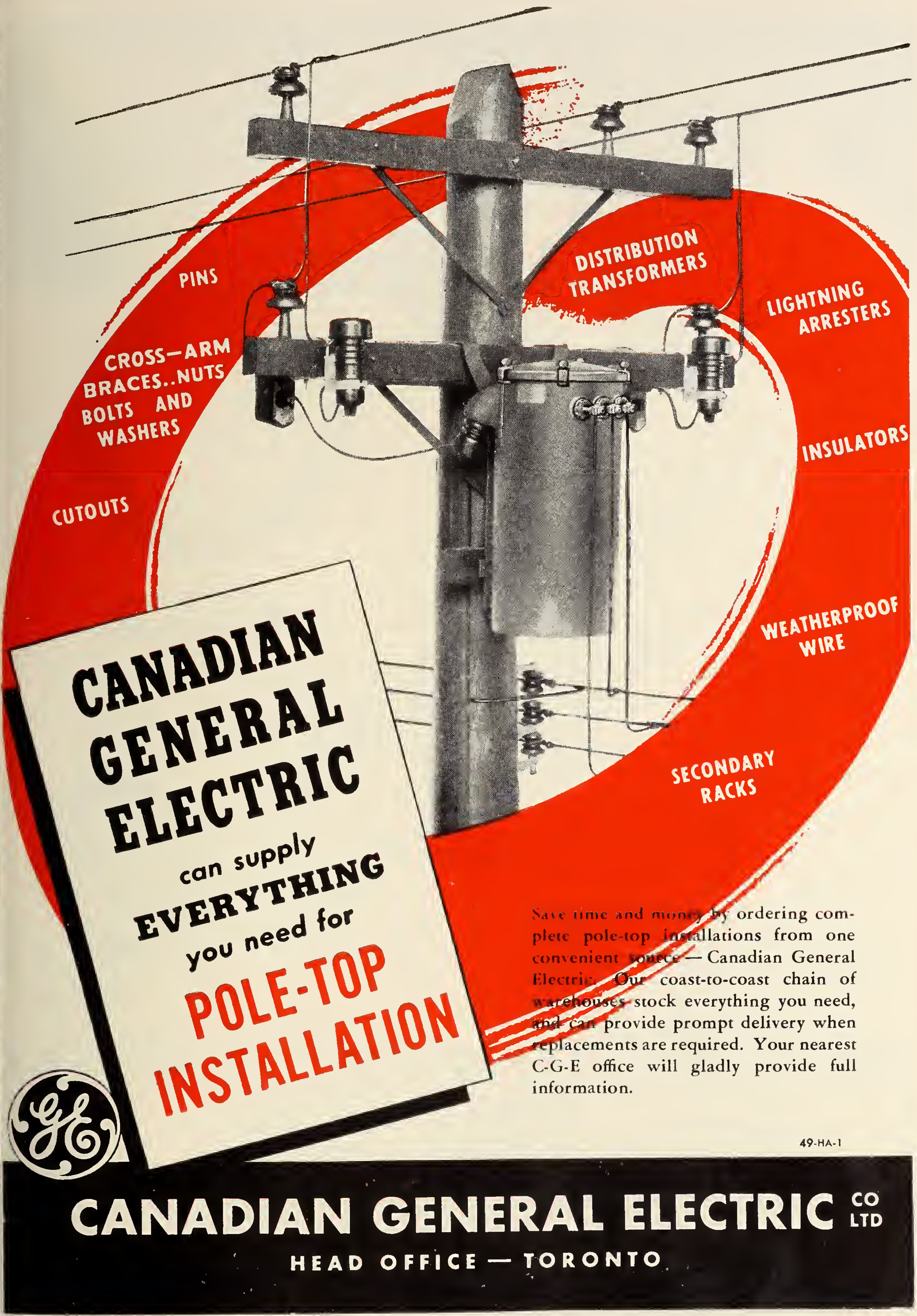
M. R. Hyslop, ed. American Society for Metals, Cleveland 3, Ohio, 1948. 720 pp., 9¼ x 6 in., fabrikoid, $15.00.

This comprehensive survey of the metallurgical literature published during 1947 continues the useful series started in 1944. The brief abstracts indicate the scope and content. In addition to the main classified arrangement of the items, a detailed subject index and an author index are provided. The addresses of the journals and periodicals abstracted are given. Both American and foreign literature are covered in the more than 5000 items included in the current volume.

HANDBOOK OF CHEMISTRY AND PHYSICS.

C. D. Hodgman, ed. Chemical Rubber Publishing Co., 2310 Superior Ave., Cleveland 14, Ohio, 1948. 2686 pp., tables, cloth, $6.00.

The present issue of this standard reference work retains the original purpose —to provide accurate data constantly wanted by physicists and chemists in convenient form for quick reference. The present edition has been revised throughout and new matter added where called for. In addition to the material relating strictly to chemistry and physics, there is considerable information in the fields of metallurgy, magnetism, electricity, radio and electronics, photography, statistics, geology, mineralogy, etc.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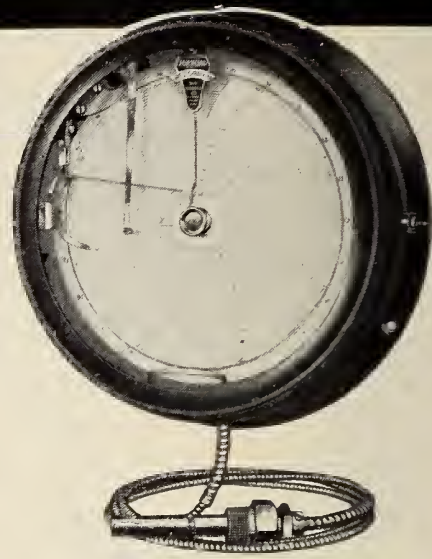
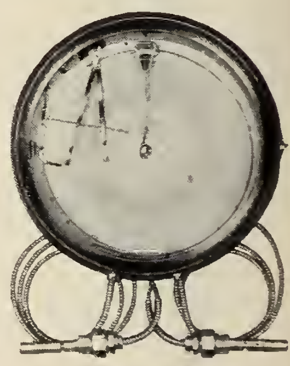




BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

New Equipment and Developments

Bepco Canada Limited, 4018 St. Catherine Street, West, Westmount, Montreal 6, has expanded its repair department which is now in a position to service all types of electrical instruments. The repair staff includes six skilled instrument repairers.

•

Through manufacturing arrangements between Eaton Manufacturing Company and The McKinnon Industries, Ltd., Eaton two-speed axle units are now being made in St. Catharines, Ontario, of Canadian materials. General Motors, International Harvester, and Ford will offer these axles on various truck models.

•

To minimize heating requirements and keep viscous oils in a fluid state, two tanks in a Montreal oil refinery were insulated with a three inch thickness of loose mineral wool. Aluminum sheets were fastened to the tank surfaces by means of " Z " lugs. Loose mineral wool was installed between the sheets and the tank at each rise of sheets. The aluminum sheets not only serve the purpose of supporting the insulation, but also act as a vapour seal and weather protector.

•

According to information received from the Canadian General Electric Company it is estimated that 12,000 television receivers will be made in Canada during 1949. Although the Dominion Government has not yet granted TV transmitter licenses, roughly ten per cent of all Canadians are within range of United States television stations.

C.G.E. is now producing a second TV model.

•

A special committee has been set up to advise on the use of magnesium. The purpose of the committee is to give direct assistance to Canadian industry on points regarding the properties, fabrication, surface treatment, and design of magnesium alloy products. Enquiries on these points should be directed to the committee chairman, L. G. White, Suite 1505, 320 Bay Street, Toronto, Canada. The committee is made up of representatives of government agencies, universities and industry.

Chatham Products Company, 15 East Runyon Street, Newark 5, N.J., is marketing a new safety device that provides instant automatic light when the regular source of current is interrupted. When current is restored the emergency light goes off automatically. The fluorescent tube in the emergency light will provide approximately ten hours of emergency service. It is operated with standard dry cell batteries and uses standard Mazda fluorescent lamps. For details communicate with the Company.

•

Sir George Godfrey & Partners (Canada) Ltd., 751 Victoria Square, Montreal, announce that they now represent Tenaplas Ltd., of Berkshire, England, manufacturers of " Polythene " pipe, tubing, fittings, etc.

Polythene pipe and tubing is extruded from polymerized ethylene and it is one of the latest achievements of the British plastics industry. The Canadian agency will be pleased to furnish further details.

•

On March 4th the Right Honourable C. D. Howe, Minister of Trade and Commerce, stated that during 1949 public and private investment outlay for new construction and for new machinery and equipment in Canada is expected to be increased by 8%. In a second report, tabled at the same time, the Minister predicted continued improvement in the supply of building materials even though a few items will continue to be in short supply.

Mr. Howe's report indicates that public and private investment intentions call for capital expenditures in 1949 of \$3.3 billion as against \$3 billion spent in 1948. The programme will comprise \$2 billion for new construction and \$1.3 billion for new machinery and new equipment. Allowing for price rises during 1948, averaging 7 per cent, the 1949 programme in terms of volume will involve a slight increase over 1948. In these terms, volume of construction will be higher by about 6 per cent, and equipment lower by about 6 per cent.

•

Montreal Locomotive Works Limited has a backlog of orders amounting to approximately \$27,000,000. This amount is \$8,000,000 greater than the value of the unfilled orders a year ago.

The backlog includes about \$5,000,000 of orders on Diesel-electric locomotives for Canadian railways and \$18,000,000. for steam locomotives for delivery to India, Newfoundland and Nigeria. All export orders will be paid for in United States dollars.

The first Diesel-electric locomotive — a switcher — manufactured by the Company was exhibited at the International Trade Fair last May. It was well received by Canadian railway officials and their growing interest is evidenced by steadily mounting inquiries and orders. Electrical equipment for Diesel units will be supplied by Canadian General Electric Company and Dominion Engineering Works Limited will supply the engines.

•

Veterans established under the Veterans' Land Act have obtained, through that branch of the Department of Veterans' Affairs, 8,078 tractors, 2,903 one-way tillers, 1,816 binders and 8,608 combines. These figures are compiled up to the end of March, 1948.

•

The Wade Tool Company of Waltham, Mass., has announced a new development in connection with the manufacture of collets. All collets made by the Company now have their threads ground from the solid after hardening. By this new process it is claimed that possible distortion in thread pitch or shape is eliminated. Details may be obtained from the manufacturer.

•

According to Earle C. Brockett, vice-president of Canadian Johns-Manville Co. Limited, Canada's business boom is expected to continue this year and may equal the all time peak of 1948.

Mr. Brockett also stated that his Company has spent 12 2/3 million dollars in Canadian expansion since the war and work now in progress will bring the total to, approximately, \$14 million before new production facilities are completed.

•

Canadian General Electric Company has opened a new office and warehouse in Sherbrooke, Quebec. The building is located at 33 Belvidere Street. It has office and showroom facilities and a three-storey warehouse of approximately


For want of a Nail
The shoe was lost...
IN THE DAILY EFFORT to secure continuous production the dependable movement of materials within the plant is of paramount importance. While an overworked crane is busy elsewhere, the empty lathe and idle machinist are costing money. If repeated many times, this can result in a crippling overhead.
The Mechanical Division of Dominion Bridge Company specializes in the design and fabrication of many types of cranes and other handling equipment. The lengthy experience and complete facilities of this department are at your disposal.
For want of a Crane
The day was lost
MECHANICAL DIVISION*
DOMINION BRIDGE
COMPANY LIMITED
*OTHER DIVISIONS: Warehouse, Platework, Boiler, Structural.
Plants at: Montreal, Ottawa, Toronto, Winnipeg, Calgary, Vancouver.
Assoc. Companies at: Edmonton, Sault Ste. Marie, Quebec, Amherst.

3,000 square feet. Construction is of reinforced concrete with a stone and brick exterior. A staff of thirteen, under the direction of A. H. Duchene, is employed. A branch of the Company has been located in Sherbrooke since 1919.

•

The footwear plant of Dominion Rubber Company Limited, located at St. Jerome, Quebec, has been awarded the National Safety Council's Distinguished Service to Safety Award. Announcement of the award was made by N. H. Dearborn, president of the National Safety Council of Chicago. The plant has operated for 6,411,303 man hours without a disabling injury since December, 1946. During 1948 this plant was awarded the "Excellence Shield" donated by the Quebec Association for the Prevention of Industrial Accidents — the highest honour given by the Association. It was also awarded the Department of Labour Trophy, competed for by firms which operated over 1,000,000 man hours without accident during a twelve-month period.

•

Output of refined petroleum products in Canada in 1948 was almost 11 per cent higher than in the preceding year. Major increases were in motor gasoline, kerosene, and fuel oil. According to the Dominion Bureau of Statistics, the year's aggregate output amounted to 80,969,000 barrels as compared with 73,-77,000 in 1947.

•

In the annual report of the International Nickel Company of Canada Limited, Robert C. Stanley, chairman of the Board of Directors, stated "Underground development totaled 84,152 ft., compared with 54,790 in 1947. This brings the total underground development to over 250 miles."

Technical research and development on improving mining and processing methods have proved to be of major importance in efforts to recover and produce greater quantities of metals and to counteract the sharp upward trend in costs which have been experienced since the beginning of the war. This work was expanded during the year and will be continued in 1949.

Capital expenditures made by the Company amounted to over $14 million as compared with $9½ million in 1947. The items of larger importance were $4½ million on the mines and $5 million on the new process plant at Copper Cliff for the production of nickel in the form of nickel oxide sinter for the market and for intermediate refinery products. Capital expenditures for 1949 are estimated at approximately $18 million.

•

Commenting on the production record now being achieved by C.G.E.'s Cobourg plant, which is devoted to the output of plastics, H. M. Turner, president of the Company said "The success of plastics in many phases of Canadian life is being assured by sound engineering and production practice. Plastics combine many of the best characteristics of other materials such as metals, wood, glass and even rubber and they have many special qualities all their own. To apply these qualities most efficiently to each of the hundreds of applications in the home, in industry and commerce, requires engineering and production knowledge of a special sort, backed up by progressive research."

The new Cobourg plant represents the first phase of C.G.E.'s plan to establish the Company's plastic effort in one highly specialized plant with its own engineering and production facilities.

•

J. R. White, vice-president of Imperial Oil Limited, speaking in Toronto on March 16th said "If current production progress is maintained then it is safe to predict that Canada will be self-sufficient in oil by 1958". To reach the day when Canada will no longer have to import petroleum from the United States, it will be necessary to construct a network of pipe lines across the country. The first of these pipe lines will be one stretching 450 miles from Edmonton to Regina. It will be constructed by 1950 at an initial cost of $35,000,000. Seventy thousand tons of steel will be required.

•

"Channel Flushing", a new development in induction melting furnaces has been announced by the Fisher Furnace Division of Lindberg Engineering Company, Chicago. According to the manufacturer "Channel Flushing" always keeps the channels between the two-chamber induction melting furnaces clean and free of slag or oxide accumulations. The primary coil of the furnace transformer is located in a manner to cause a greater volume of molten metal to be impelled into one chamber than the other. This raises the molten metal in one chamber, and lowers the level in the other. Every 60 seconds, when the power is cut off, the higher level subsides, and the molten metal flows to the other chamber until the same level exists in both chambers. When the current is restored, the molten metal is forced in the opposite direction, again causing a higher level in the one chamber than the other. For further information, communicate with the Lindberg Engineering Company, 2444 West Hubbard Street, Chicago 12, Illinois.

•

The Decca Navigator Company has secured a contract from the Bahrein Petroleum Company for a chain of Decca transmitting stations as a survey aid in connection with the search for oil beneath the bed of the Persian Gulf.

•

The Rubatex Division of Great American Industries Inc., 230 Park Avenue, New York 17, N.Y., announces the full development and present availability of Rubatex gas-expanded closed-cellular rubber, for general use in industry and transportation, and in products for the public. For details communicate with the manufacturer.

•

Canadian Standards have been determined for fire-hose, window cleaning, radio interference, railway gates and several other items since January 1st, it is announced by the Canadian Standards Association. Details may be obtained from the Association, National Research Building, Ottawa, Ontario.

•

Canada's gross national production in 1948 was $15,414 millions, about three times higher than in 1939.

•

Quebec newsprint mills provide paper for three out of every 10 newspapers in the world said K. H. J. Clarke, assistant manager of sales for the International Nickel Company of Canada Limited at a meeting held, recently, in Three Rivers, P.Q.

"St. Maurice Valley is the largest newsprint production area in the world and the pulp and paper industry is one of Canada's most important", said Mr. Clarke. Discussing what the pulp and paper industry means to Quebec's economy, Mr. Clarke pointed out that, apart from income tax payments by the corporations involved, the industry spends close to $400,000,000 in Quebec each year for wages, services, materials, and supplies.

•

Dominion Oxygen Company Limited, has announced the opening of their new oxygen and acetylene plant at Arvida, P.Q. This plant will serve the requirements of all industry in the Lake St John area. The Company's other plants are at Montreal, Shawinigan Falls, Quebec, Toronto, Merritton, Welland, Sault Ste. Marie, Winnipeg, Saskatoon and Vancouver.

•

Appointments and Transfers

Robert H. Macdonald has been appointed assistant sales manager, reinforcing steel division, The Steel Company of Canada Limited. He will be located at the Company's general sales office in Hamilton. Mr. Macdonald started his business career with the Company, in the chemical laboratories, in 1937 and later represented the welding rod sales division. He served overseas during World War II.

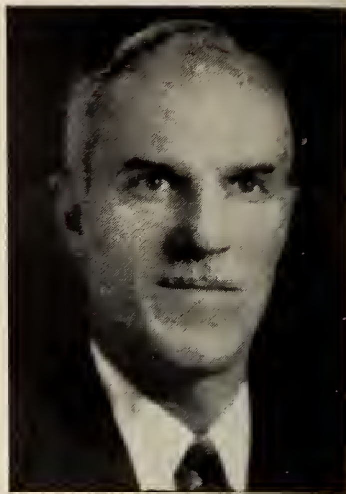
•

J. M. Paterson, manager of Canadian sales, Aveling-Barford Limited, Grantham, England, has announced the appointment of the following agents: Maritimes and Newfoundland: J. Clark & Sons Limited, 123 York Street, Fredericton, N.B. (This company has branches throughout the Maritimes); Quebec: Chas. Cusson Limited, 284 Ontario Street West, Montreal. (branches at Val d'Or and Quebec City); Ontario; M. L. Baxter Limited, 1900 St Clair Avenue West, Toronto; Saskatchewan and Manitoba: Vulcan Iron and Engineering Limited, Winnipeg, Manitoba; Alberta: Industrial and Road Equipment Limited, Calgary and Edmonton; British Columbia: Vancouver Engineering Works Limited, West Sixth Avenue, Vancouver. Mr. Paterson will maintain offices at 9 Bruel Gardens, Toronto.

•

The Foundation Company of Ontario Limited has announced that W. E.

Hickey has been appointed district engineer. He will be located at the Company's Toronto Office.



L. I. Playfair

L. I. Playfair has been appointed manager of the Montreal district of Canadian General Electric. He is responsible for the sales and service of all the Company's products in the province of Quebec through its offices and warehouses in Montreal, Sherbrooke, Three Rivers, Quebec City, and Chicoutimi.

•

Kenneth J. Libby

A. C. Wickman (Canada) Limited have opened a new office in Windsor, Ontario, and Kenneth J. Libby has been appointed district representative in that area. Mr. Libby takes over the duties relinquished by Earle Harding.

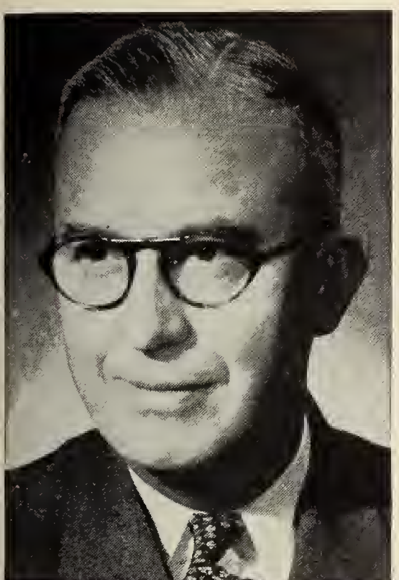
•

Alchem Limited, Burlington, Ontario, announces the appointment of G. Garnett Simms as district engineer for Ontario. He will make his Headquarters in Toronto. Mr. Simms graduated in metallurgical engineering from the University of Toronto in 1938 and before joining Alchem in 1946 was employed by International Nickel Co. of Canada Limited and the Aluminum Company of Canada Limited.

Donald H. Isbister has been appointed service engineer in the Ontario district for Alchem Limited. Mr. Isbister graduated in mechanical engineering from the University of Toronto and served with the Royal Canadian Electrical and Mechanical Engineers in Canada and overseas during the war. Before joining Alchem in the spring of 1948 he was on the staff of the University of Toronto.

•

D. M. Waterous, formerly vice-president and general sales manager, has been appointed vice-president and general manager of Waterous Limited, Brantford, Ontario. B. M. Kennedy, formerly assistant general sales manager, succeeds Mr. Waterous as general sales manager, and N. L. Elliott is his assistant.



F. G. Willmot

Fred G. Willmot has been appointed assistant general sales manager of the Goodyear Tire & Rubber Company of Canada Limited. Mr. Willmot has had over twenty years of experience with the Company and he is well known in the rubber industry. He has been manager of several departments in the sales division and previous to his present appointment was manager of tire sales.

•

Gordon H. Rochester has been appointed timber controller of the Department of Trade and Commerce. He succeeds W. E. Uren who continues his other duties as chairman of the Dominion Coal Board. As timber controller, Mr. Rochester will be responsible for the regulation of lumber exports which are still under control.

•

C. T. Ball formerly wire and cable sales manager of the Northern Electric Company Limited, general sales division, has been appointed eastern district sales manager. He succeeds D. C. McKellar who has been transferred to Toronto as central district sales manager.

Clayton W. Morgan has been appointed sales manager of Henry Disston and Sons, Toronto. He was previously manager of the Company's Moncton, N.B., branch.

•

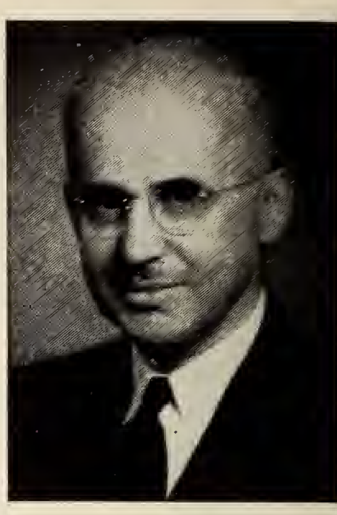
R. W. Ryan has been appointed executive assistant to G. W. G. McConachie, president of Canadian Pacific Air Lines. W. G. Townley has been appointed general manager of operations in Winnipeg. He will move his headquarters to Vancouver when the Company's trans-Pacific operations begin. He will also be responsible for control of domestic operations. The Company is now planning a trans-Pacific schedule which will call for nearly 16,000 miles of air routes to Australia, New Zealand, and the Orient. The existing domestic services of the Company embrace nearly 10,000 route miles.

•

At the fifth Annual Meeting of the Canadian Fan Manufacturers' Association the following officers were elected for the year: president, A. H. Blake, manager of the B. F. Sturtevant Company of Canada Ltd.; vice-president, J. H. Gregory, sales manager of the Canadian Blower & Forge Company Ltd.; secretary-treasurer, L. O. Monroe.

•

F. W. MacLaren has been appointed manager of the newly opened C.G.E. office and warehouse which is located at 465 George Street, Sydney, N.S.



V. E. North

Victor E. North has been appointed to the staff of the apparatus division of C.G.E. A native of Nova Scotia Mr. North graduated from the N.S. Technical College with the degree of B.Sc (elect.). Following the C.G.E.'s "Test" training he held a number of appointments in the apparatus organization in the Toronto and Montreal offices of C.G.E.

E. B. MacRobie

E. B. MacRobie has been appointed manager of the industrial heating section of C.G.E.'s supply department.

W. I. Turner

William I. Turner, formerly assistant general manager of Railway & Power Engineering Corporation Limited, has been appointed vice-president and general manager of Canadian Controllers Limited. Mr. Turner graduated in electrical engineering from the University of Toronto in 1925 and has been closely associated with the industrial control industry in Canada for the past 19 years.

•

J. G. MacDermot, manager of the Western Division of Monsanto (Canada) Limited has been elected a vice president of the Company. A native of Vancouver Mr. MacDermot joined I. F. Laucks Ltd., in 1939 and that Company became a subsidiary of Monsanto in 1944.

H. Neville Potter has been appointed executive vice-president and general manager of the Dearborn Chemical Company Limited, 2454 Dundas Street West, Toronto. Mr. Potter graduated from the University of Toronto in 1937 with a degree in chemical engineering. He enlisted in the Royal Canadian Air Force, serving for three years until discharge in 1945, at which time he was appointed technical director of the Company. He was elected to the board of directors in 1947. Dearborn Chemical Company Limited is a manufacturer of boiler feed water treatment, rust preventives and wrappers. Main offices and laboratories of the Company are in Toronto and sales offices are maintained in Montreal, Saint John and Vancouver.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

The Bristol Company of Canada Limited, 71-79 Duchess Street, Toronto, has available a new bulletin "A New, More Accurate Method of recording Smoke Violations".

•

Webster & Sons Limited, 724 Canada Cement Building, Montreal, P.Q., offer a booklet entitled "Materials for Better Floors". The publication is well produced and most informative.

•

The foreign trade service of the Department of Trade and Commerce issue an interesting weekly booklet, "Foreign Trade". It is published by the authority of the Right Honourable C. D. Howe, Minister of Trade and Commerce. It should be of particular interest to firms and individuals seeking export markets. The publication is also available in French. A nominal charge of $1.00 for fifty-two copies is made. To be placed on the mailing list, forward the sum of $1.00 to The Editor, "Foreign Trade", Foreign Trade Service, Department of Trade and Commerce, Ottawa, Ont.

•

Hanley Company Inc., 101 Park Avenue, New York 17, N.Y., have produced an excellent two-colour brochure on "Impervo" Floor Brick. This publication is very well produced and it is illustrated by photographs and line drawings giving dimensions.

•

"Greater Quantities at Lower Costs" is the title and theme of a new twelve-page, two-colour pulverizer bulletin just released by Lippmann Engineering Works, 4603 West Mitchell St., Milwaukee. To assist in the promotion of ag-lime, one section of this bulletin is devoted to showing how much an adequate liming programme can do for both crop and pasture land. Included also are capacity tables, dimensions and specifications for the 15 sizes of pulverizers Lippman builds. Ask for the publication by number, 1160.

Lincoln Electric Company of Canada Ltd., 179 Wicksteed Avenue, Leaside Toronto 12, Ontario, offers a reprint from "Machine Design" of an article "Channel-Grid Stiffener System". The article was written by Charles Bailey, chief engineer, and David Boyd, works manager of the general engineering division of John Inglis Co. Ltd., Toronto, Ont.

•

A new bulletin on Bristol Diesel engine pyrometers has just been published by the Bristol Company of Canada Limited, 71-79 Duchess Street, Toronto. Approved commercial type diesel engine pyrometers and thermocouples suitable for use on all types of diesel engines are described and illustrated by photographs and dimensioned drawings. Ask for bulletin P-1239.

•

The March 1949 issue of the "Dominion Engineer" is devoted to an article on the stability of crawler cranes and shovels. The author is E. A. Nix, engineer of the Dominion Hoist and Shovel Company Limited. Copies may be obtained on application to the Dominion Engineering Company Limited, P.O. Box 220, Montreal, P.Q.

•

Nickel Information Service, a department of the International Nickel Company of Canada Limited, 25 King Street, West, Toronto 1, Ontario, offers the following publications to *Journal* readers.

The "Corrosion Reporter" the latest issue of which features notes on cellulose and viscose rayon. It contains a twelve page report dealing with corrosion problems encountered during the processing of rayon. "Corrosion Tests in Organic Sulfations and Sulfonations", an eight page booklet of interest to process industries. It contains technical information and tables on the results of research conducted by the corrosion engineering section of the Company's development and research division.

Crane Limited, 1170 Beaver Hall Square, Montreal 2, Quebec, offers a forty-eight page booklet on "Pipe Coils".

•

The "Northern Circuit", a quarterly publication issued by the Northern Electric Company Limited, 1620 Notre Dame Street, West, Montreal, Quebec, is available to readers of the *Journal*. The content of the publication is of a general nature and presentation is in magazine style.

•

A new twenty-eight page booklet has just been released by Dominion Wheel & Foundries Ltd., exclusive manufacturers of "Domite" alloy irons. It represents the technical story of Domite alloy irons. The various types of Domite irons are dealt with under separate headings showing the physical properties and applications for metal products manufacturing. Well illustrated by charts and photographs, the booklet will prove a useful reference for all interested in alloy irons and their uses. Copies may be obtained on request from Dominion Wheel and Foundries Ltd., 171 Eastern Avenue, Toronto.

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The Coventry Gauge & Tool Co. Ltd., Coventry, England, offers a four-page brochure catalogue on their "Matrix" Micro-Maag Internal Micrometer. This catalogue is very well produced. Copies may be obtained, without charge, on request.

•

Forano Limited with head office and works at Plessisville, Quebec, and sales and service office at 335 Canada Cement Building, Montreal 2, Quebec, has issued a twenty-page publication "Simplified Selection Tables for Light and Heavy Duty Forano V-Belt Drives". This brochure is very well produced and the tables it contains should prove to be of great assistance to the user. Ask for Catalogue No. VB-48.

•

Frederick C. Baker & Co., 229 Yonge Street, Toronto 1, Canada, has released a new condensed instrument catalogue. It lists many instruments required for general industrial use as well as special types for power plants, laboratories, pulp and paper companies, air conditioning, mining, agriculture, factory, educational institutions, research, etc. Ask for "Condensed Instrument Catalogue."

•

Information on the new electric-control C Tournapull is given in a new broadside, TP-167, just released by R. G. LeTourneau, Inc., Peoria, Ill.

•

A new industrial gas burner catalogue describing high and low pressure equipment for all common gaseous fuels has just been released by Surface Combustion Corporation, Toledo, Ohio. Divided into 10 sections and containing over 130 pages, this attractive maroon-bound catalogue is designed as a ready reference source for all engineers concerned with specifications and design of gas combustion equipment. A copy may be obtained by writing to Surface Combustion Corporation, Toledo 1, Ohio.


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"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

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COVER PICTURE

The Province of Quebec is Canada's greatest producer of hydro-electric power.

On our cover are shown the five 44,500-hp. generators at the La Tuque development of the St. Maurice Power Corporation. The total output is 222,500 hp.

Photo courtesy The Shawinigan Water and Power Co.

A Message from The President

It is the privilege of your President, during his term of office, to accept official blame for all unfavourable developments, and official credit for all favourable developments concerning The Engineering Institute of Canada. My purpose will be to see to it that causes for official blame are restricted to a minimum, and that true credit is passed on to the members and staff, without whose loyal support the Institute would be meaningless and its presidency a mere sinecure.

Since the founding of The Canadian Society of Civil Engineers in 1887, marked changes have taken place in engineering. At that time there were essentially only two kinds of engineering—one handled by Civil (or civilian) Engineers, and the other handled by Military Engineers. The Society was founded to serve the former.

Subsequent expansion of engineering knowledge far beyond the ability of any one person to grasp, has resulted in the division of the civil engineering field into many parts, each handled by engineers specializing in that particular part, only one of which is now called civil engineering. At the same time, warfare has expanded from embattled armies to total war in which all engineers participate more or less directly. The title Military Engineer, therefore, has lost much of its former significance. About thirty years ago, when these trends had become evident, the name of The Canadian Society of Civil Engineers was changed to The Engineering Institute of Canada.

While these changes were occurring in engineering, engineers also were changing. In 1887 engineers generally lacked professional consciousness and were, to a substantial extent, high grade technicians. That there were many individual exceptions to this is evidenced by the founding of The Canadian Society of Civil Engineers, the charter of which made it quite clear that this was to be a professional society. Professional consciousness in a large group, however, develops slowly.

An engineering education, if accepted by the individual as a personal attribute to be used solely for personal gain, could well lead to regrettable egotism or to equally regrettable class consciousness. If leavened, however, with a full understanding of all that is stated and implied in the Code of Ethics of The Engineering Institute of Canada, it should lead to a professional consciousness based directly upon the Golden Rule and a willingness to serve the profession and the general public without thought of personal gain. With the support and co-operation of all members, I hope to see a substantial advance in such professional consciousness among engineers during the coming year.

In selecting me for your President, you, the members of The Engineering Institute of Canada, have conferred upon me the highest honour you have to bestow. There is no higher position in the engineering profession. It will be my endeavour so to fulfil your expectations of me, that at the end of my term of office I may face you with the knowledge that I have done my best, and it has been acceptable to you.

John E. Armstrong

President.

ELECTRONICS IN AIR POWER

by

Wing Commander C. B. Limbrick

Director of Air Plans (Scientific), R.C.A.F. Headquarters, Ottawa

This paper, specially prepared for publication in the *Journal*, discusses the uses to which electronic devices are being put today for the operation of high speed aircraft, for purposes where the requirements for instantaneous and accurate reactions to be transmitted are too fast for accomplishment by the human senses.

It is necessary to understand what is meant by "Air Power" and "Electronics" before attempting to discuss the role of electronics in air power. With the advent of guided missiles there has been, inevitably, considerable controversy and discussion as to the present exact meaning of "Air Power". The writer's personal definition is: "An armed force, and its ancillaries, that normally utilizes air as the supporting element for the manoeuvres of its principal military equipment."

It seems that the descriptive word or term "Electronics" is now often used to classify most, if not all, devices using electricity, for operating power; for instance, advertising signs, toasters, toy trains, etc. For the purpose of this paper "electronics" may be defined as the application of thermionic tubes or valves to devices used in air power. Other electric apparatus employing tubes, such as diathermy machines, movie sound machines, etc., could be classified as electronic devices and as components of air power. This, because human beings are necessary for some part of the operation, and maintenance of all military functional equipment, and such electrical devices not generally included under the classification of "military electronics", are necessary in the general maintenance of health and morale of air force personnel.

The air power of today, employing aircraft flying at velocities close to the speed of sound, and guided missiles travelling at supersonic speeds, require precision senses for their efficient and safe operation. So we may well define electronics when applied to air power as the "central nervous system" (fig. 1) tying together, and stimulating, as required, all the varied equipment that requires activation with great rapidity and accuracy of timing, to ensure efficient operation of the whole system or force.

Human Senses Too Slow

The time is rapidly approaching when even the relatively concise and speedy co-ordination of brain and muscle by a healthy young man is not good enough to ensure the necessary operation of aircraft controls. Brain and muscle may not provide the rapid complicated aerial movements of transonic or supersonic aircraft in combat operations. Precision is limited and affected by re-action time and fatigue, errors of muscle co-ordination, detection and correction of minute variations without appreciable time lapse, and errors of judgment.

Sensory requirements of functional equipment employed in air power are almost fantastic, certainly far beyond the limits of present human accomplishment. They are even greater than certain amazing powers possessed by many birds, and also beyond the possibilities of training human senses. We humans cannot see or hear far enough or well enough; we cannot speak with sufficient volume to reach any great distance nor with any degree of security against eavesdroppers, we cannot say sufficient words per minute to convey the required amount of information fast enough for high speed operations. Practically all the main sensory powers of man must be improved beyond the limits of human acuteness or training, if air power is to make full use of modern high speed aircraft and contemporary equipment.

Air power, due to the speed and complexity of modern aircraft and weapons, and to operations in an element unnatural to the normal activities of humans, requires extraordinary powers of mental and physical skill or effort. Systems for ground control of air operations also require special qualifications to fully exploit the operational potential of modern aircraft. The brain functions of normal men are not sufficiently fast or proficient to fulfil all the stringent demands. Physical effort is required beyond normal human capacity and endurance. In addition to the necessity of providing devices to assist the human powers, means must be available to deny to opposing forces the use of similar devices. Air power employs many ingenious electronic countermeasure equipment designed to annoy the enemy and to offset enemy counters to our electronic material.

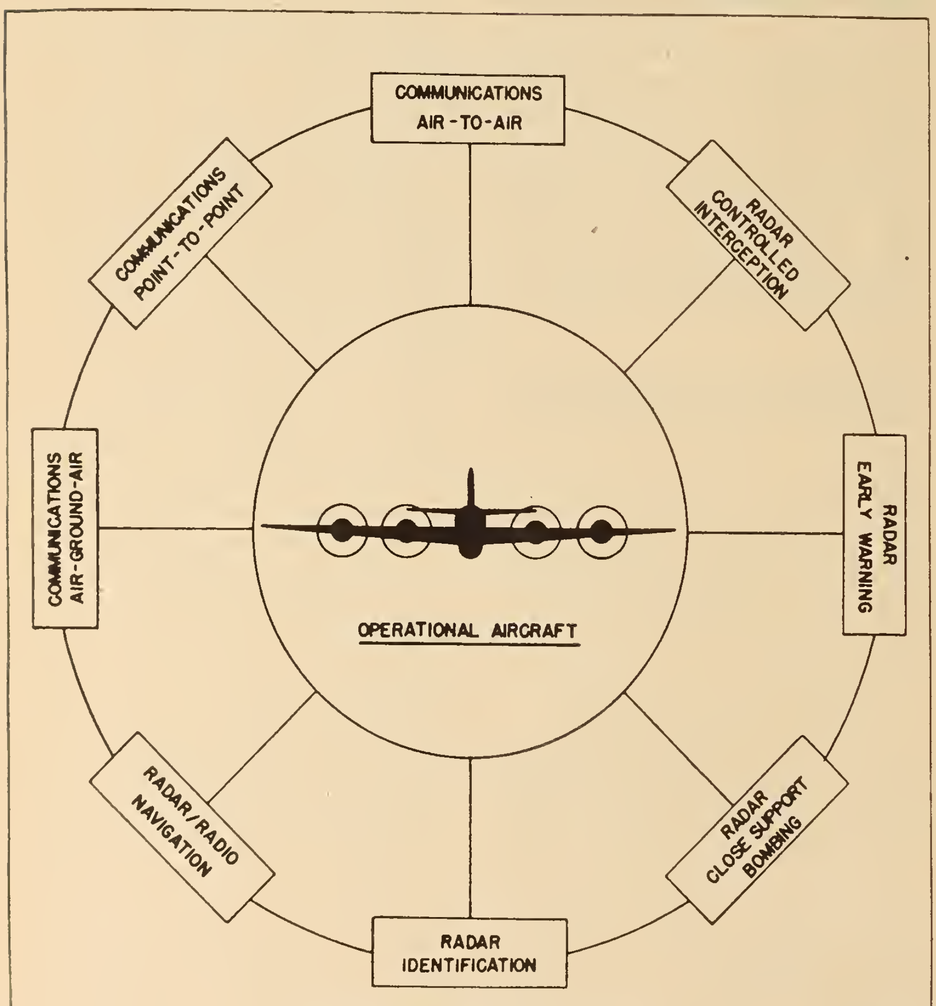
Aircraft may be divided into three categories: those manned and operated by aircrew which normally rely on the human senses unaided by any extra devices; aircraft operated by instrument assisted aircrew; and flying machines which normally are flown and navigated entirely by automatic devices. The first type is rarely encountered in military formations; the second is the normal situation in modern air forces; and the last is partially in being and will perhaps be in general use by say 1955 or 1960. In addition to aircraft and guided missiles, air power utilizes many devices and weapons which require automatic or semi-automatic operation and control. This automatic operation is nearly always provided by electronic equipment.

In Military Operations

It is, then, quite evident that man has dreamt of, designed and produced military aircraft, flying machines, and weapons, so complex and fast that his normal senses, though highly trained, are not suited to adjust themselves to this new conception of air power. Here electronics in many forms has taken over the task, permitting man to produce, and operate efficiently, modern air machines, and to cope with the exotic air power of the future. Without electronics, air power would be almost useless, and any country or nation that does not maintain progress in the development and use of electronics can not compete with those nations whose air power utilizes to the full the assistance provided by electronic devices.

As a result of new concepts of " Blitz Kreig " and " Superblitz ", movements and operations must be timed with extreme precision. Those responsible for planning and operation of air power must now consider space in terms of time rather than of miles, with aircraft flying at six to seven hundred m.p.h. and guided missiles with velocities of over 3000 m.p.h., all operational movements and communications must be both rapid and accurately timed. Electronics have demonstrated what super-velocities can do to shrink our world. It matters little to people at each end of a radio telephone terminating at Ottawa and London that the space between terminals is 3500 miles. To the conversing parties there is no perceptible time lag, and therefore no space between the parties. However, the tremendous speed of electromagnetic waves is barely high enough to cope with modern air power requirements. Automatic equipment, more efficient operating techniques, and new terminal equipment must be employed to overcome delays which would cancel the advantages of radio velocities. Considerable effort is being expended to find a solution to limitations in the use of micro-wave devices, due to relative short ranges of line of sight transmission.

There exist no mechanical timing devices which can provide the accuracy necessary to ensure rapid activation and operation of defence and attack forces, and to collect and integrate all the information that must be available to ensure the optimum use of air power at the disposal of a commander. Electronic methods of timing use the highest speed available to man, that of light. This speed, together with an accuracy of better than one quarter of a millionth of a second, provides a timing device unequalled by any mechanical device. Electronic equipment will accept and reject matter from many sources of information. It will integrate, compute and display the final complete answer. If necessary, it will automatically encypher the information, despatch it to many centres and there automatically decypher and display it. Such



ELECTRONIC NERVOUS SYSTEM FIG. 1

necessary operations may be carried out without help from humans except to start, stop and maintain the electronic equipment.

In Research and Development

Many are familiar with the more spectacular aspects of electronics used by air forces; such devices as early warning radar, controlled interception, automatic pilots, navigational aids, etc., are well known. Essential devices to ensure precision timing and rapid computation are often overlooked. Electronics not only fill requirements for accurate timing and rapid calculation for operational uses. It also provides similar methods to assist in accelerating research and development of new aircraft and weapons. Electronic computers can do in one hour the same amount of work that could be done by an experienced mathematician in six months. The nation which can produce "the best the fastest" usually has the better chance of success. Electronic calculators, telemetering devices, industrial controls, simulators and many other instruments assist in the speedy production of new airborne and associated ground equipment for military use.

Perhaps the best way to illustrate the size and complexity of the electronic role in air power is by the use of a chart showing the various functions of electronics in the different departments of a modern air force. The chart, at Fig. 2, shows the breakdown without much detail, for example, "Navigational Aids" could be further broken down into its many functional aspects such as: Long Range Navigation, Ground Controlled Approach, Distance Measuring Equipment, Homing Beacons, Airfield Surveillance Radar, etc.

Electronics have become so indispensable to air power that the old practice of stowing the electronic gear in spare spaces has disappeared. Modern procedure is to include in the original aircraft layout properly sized spaces in correct relation to the function of each piece of electronic equipment. Space requirements for electronic devices are given a high priority and serious consideration is necessary before electronic gear is discarded to make room for something else. In this atomic age the atomic bomb is, and must be, associated with air power. Research on atomic power and actual construction of atomic bombs is not possible without electronic control and measuring equipment. The basic research into atomic fission was carried out with the aid of complex electronic equipment. Precise and delicate measurements must be made with remote control, and this is only possible through electronics.

It is certain that electronics will steadily progress in value to air power. As the speed and versatility of aircraft and missiles increase, automatic control will ensure defence and offense with a minimum of human loss to the air power with superiority in electronic development.

In Civil Aviation

In our ever decreasing time-sized world, rapid and accurate communications are essential both for military and civilian purposes. This will be accomplished by the development of micro-wave relay, airborne and ground based. It can be accomplished by the increasing use of co-axial cable which, in an emergency, might well be laid by aircraft. Telephone cable has already been placed in position from aircraft flying at over 100 m.p.h.

The use of electronic devices by civil aviation is equally important. Peacetime development of military equipment is of course slower than under the stimulus of war, but fortunately electronics is one of the arts serving both military and civilian functions. Therefore, development may be coordinated and carried out with economy. For example, development of unattended radar beacons or micro-wave relay stations would be of great value to commercial airways or for military use.

In conclusion we can recapitulate by stating briefly that the role of electronics in air power is to extend limits of the human sensory system; to assist and augment human physical effort; to increase the capacity of the human mind in time/quantity terms; to reduce loss of life and equipment; to provide rapid and secure communications over any distance; and to furnish a versatile tool for the use of scientists and engineers.

Fig. 2

FUNCTIONS OF ELECTRONICS IN AIR POWER

OPERATIONAL

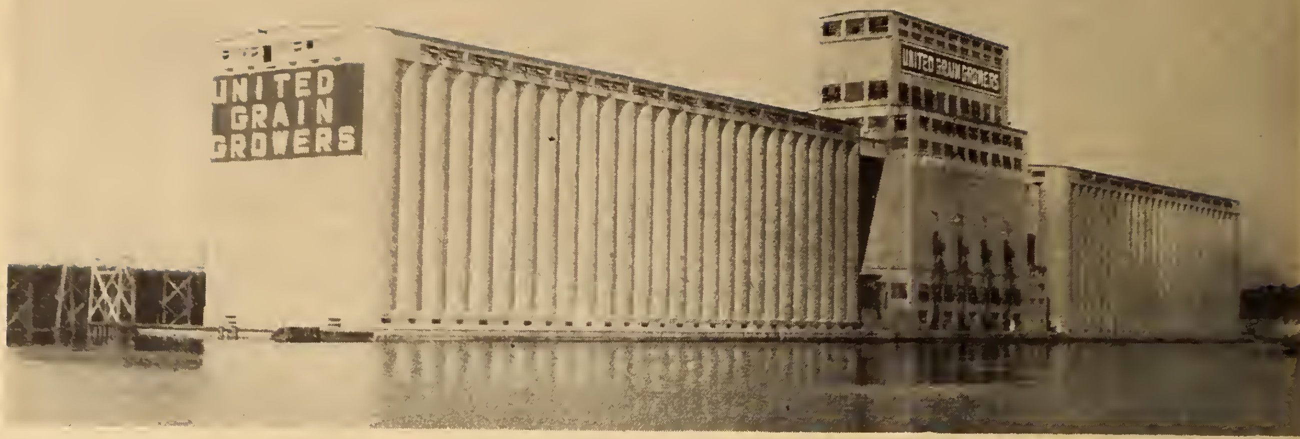
Early Warning	Communications	Rocket Ranging	Supercharger Control
Ground Control of Intercepton	Safety Devices	Operations Room Devices	Altimeters
Tail Warning	Blind Bombing	Computers	Identification
Gun Aiming and Ranging	Countermeasures	Magnetic Recording	Submarine Search
Navigation	Search and Rescue	Television (Control)	Missile Guidance
Automatic Control	Air Interception	Facsimile (Weather)	Bomb Control
	Cloud and Collision Warning	Proximity Fuses	

TRAINING

Synthetic Trainers	Demonstrators
Sound Movies	Magnetic Recording
Link Trainers	Communications
Gunnery Devices	

ADMINISTRATIVE, MAINTENANCE, RESEARCH & DEVELOPMENT, MISCELLANEOUS

Meteorological Devices	Photo Electric Devices	Intercommunications	Power Supplies
Computors	Communications	Measuring Devices	Industrial Controls
Test Gear	Cypher and Code Machines	Survey and Mapping Aids	Simulators
Medical Instruments	Ionosphere Measuring	High Frequency Heating	Telemetering
Welding Control	Infra Red Detection		Timing
Statistics	Heat Detection		



Handling and Storing Grain

and

Other Bulk Materials

by

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In dealing with a subject of such broad nature in a short time it will be necessary to confine the remarks to brief descriptions and discussions of the main features in grain handling and other plants.

It is apparent that the volume to be handled annually, hourly, or daily, has an important bearing on the choice of equipment to produce an economic operation. The availability and cost of labour is another factor influencing the choice.

This paper, therefore, is confined to a brief description and discussion of equipment and of methods presently considered the best practice where high volumes are handled. My experience has been mainly on the Great Lakes and at the Atlantic and Pacific seaboards of Canada — all high grain volume areas. A chart of shipments for the past fifteen years is shown in Fig. 1. The methods used, however, would have an application in any area.

Terminal Grain Elevators. Terminal grain elevators may be subdivided into four general types; (1) an interior or storage elevator used for the concentration of grain at a central shipping point, received directly from the farm or smaller country elevator — such an elevator usually cleans grain and ships by rail or vessel and Fig. 2 illustrates a Canadian upper lake terminal of this type; (2) a mill elevator for the handling and storage of grain for processing and manufacturing in an adjacent plant — it may receive grain by rail or vessel or both; (3) a transfer elevator for the transfer of grain from one vessel to another, or to railway cars located on an interior waterway; (4) a seaboard elevator for the transfer of grain from inland waterway vessels or railway cars to ocean vessels.

All these types are similar in general design and construction, but use somewhat different devices and arrangements. The use of reinforced concrete for the buildings is now almost universal — concrete

Fig. 2 (above) shows a Canadian upper lake terminal grain elevator of the storage type.

being a satisfactory material for bin walls. The enclosing walls of various floors, where large glass areas are present, have proved satisfactory for ventilation and for the release of dust explosion pressures, without undue building damage. A typical flow diagram for a terminal elevator is shown in Fig. 3. This illustrates a Canadian upper lake terminal, but could apply equally well to a seaboard terminal.

Grain Unloading From Railway Cars. The unloading of grain into an elevator from a railway car is commonly done by power shovel devices manually controlled by two operators within the car. These devices have long been in use and little improvement has been made since their origination, nor is any real improvement possible. This method economizes in power but uses considerable labour and is unpleasant dusty work for grain shovellers.

Air suction unloaders use considerably more power than shovel devices, and about the same amount of labour, since two men are required on the suction nozzles within the car to get the proper rate of unloading. As the weight of the suction hose is not supported inside the car, it is comparatively hard, but not very dusty, work for the operators.

In Canadian practice to-day, two 50-ton cars per hour is a good average unloading rate by shovel or suction. Real improvement is possible in the air suction method in the near future, though there is little chance of reducing power requirements.

Automatic car dumpers have also been in use for thirty years, and are to-day the best unloading device where a moderate or high volume is handled. The modern car dumper will unload a car in 4½ minutes, and is being currently designed to handle cars of 105 tons gross weight. It unloads six to eight cars per hour.

The railway car is placed on the "cradle" and locked in a central position, the side door is removed automatically and the car and cradle are tilted sideways through about 15 deg., the grain discharging to the pit below. Cradle and car are then tilted up to 45 deg. in each direction. A third tilt endways is usually necessary with a small baffle plate on the floor of the car to remove the last of the grain. The cradle is then levelled and the car removed.

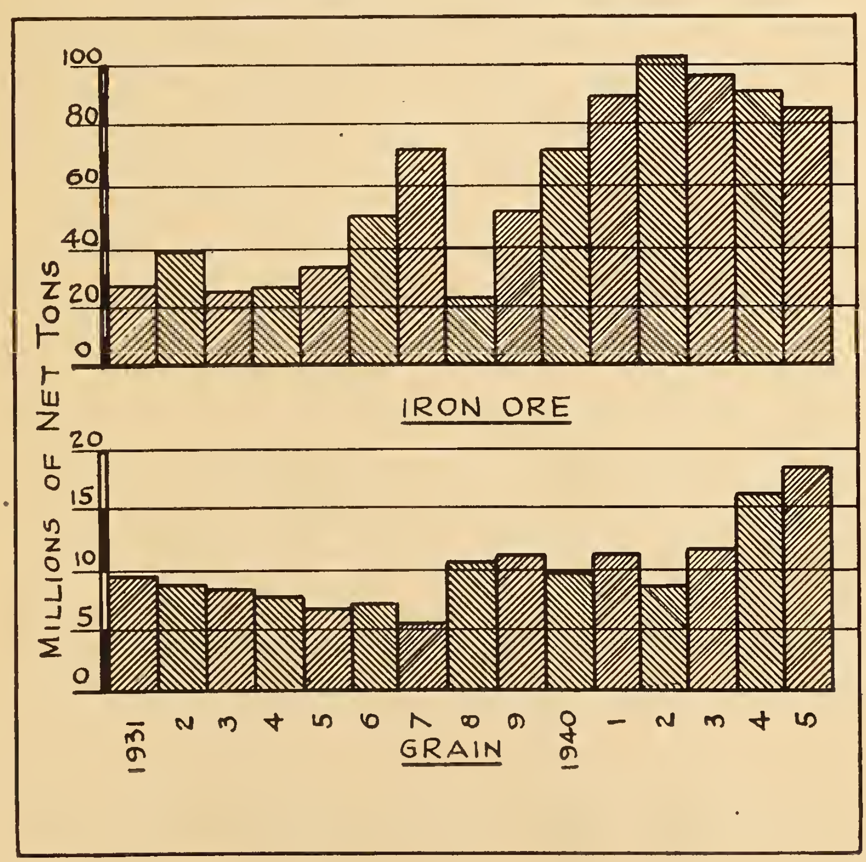
Special cars for grain carrying with hopper bottoms, and covers with hatches have been proposed. The suggestion has so far been ignored by Canadian railways, though recently Australian railroads have placed in service a practical 20-ton hoppered grain car. But cars that carry grain in one direction may have to load other commodities on the return trip. So it appears more economic to provide such special devices as car dumpers to unload ordinary general service railway cars at terminals rather than to provide special hopper cars. No change in this viewpoint is likely in the future.

Grain Unloading From Vessels. The unloading of grain from vessels presents a variety of problems. Many types of vessels are used for grain and it is difficult to select a device that will handle all classes of vessels. Air suction is probably the best method where flexibility is important. The suction hose can be used to unload almost any type of vessel or barge, and can use its own or the vessel's hoisting gear for handling and moving the hose in the hold. Air suction units with capacities of 6,000 bushels per hour are in use. Multiple units can operate through different hatches.

Where the variety of vessels to be unloaded is not too great, a marine leg of the bucket type, mounted on a boom and crosshead, is the best application. The marine leg is swung out over the vessel with the boom. The crosshead supports the inner end of the boom within the marine tower on the wharf. A hinged telescopic spout discharges grain to the wharf tower. The tower contains machinery for hoisting, weighing, and re-elevating the grain. Four to six power shovelling machines are required for cleaning up within the vessel. Such marine legs are built in capacities up to 25,000 bushels per hour on the dip.

On the Great Lakes, where considerable uniformity of lake vessels is obtained, crosshead type marine legs are undoubtedly the best high-capacity device in use. Legs are housed in moveable towers and up to four units can be placed in one vessel. They are 110 feet in length supported on a cross-

Fig. 1. Net tons of iron ore and grain carried in bulk freight vessels on the Great Lakes in seasons 1931-45.



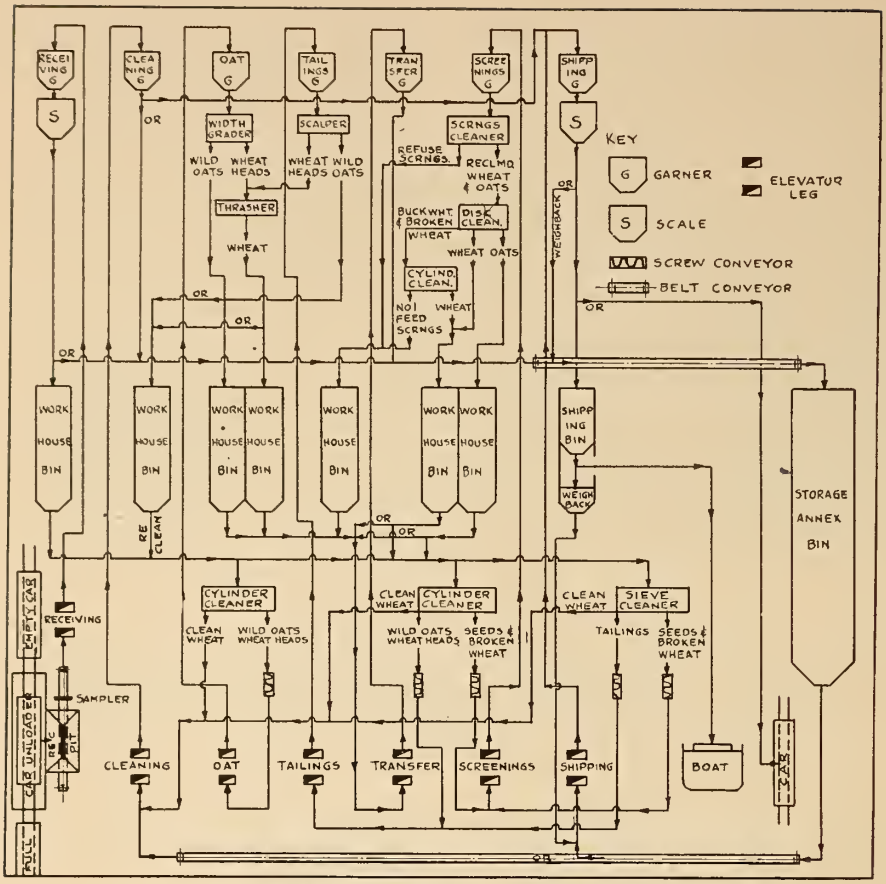


Fig. 3. Typical flow diagram of a terminal grain elevator.

head in the tower with vertical travel. The lower end of the leg is pushed out from the tower over the vessel by a pusher mechanism rolling on the back of the leg. The tower also contains all hoisting, weighing, elevating, and shovel equipment.

Four sets of heavy power shovels with two operating speeds are used for cleaning up the holds. The capacity of the large crosshead type legs is 36,000 bushels per hour on the dip. On large Great Lake bulk grain carriers of 400,000 to 500,000 bushel capacity, the average unloading rate is 24,000 bushels per hour per marine leg unit.

In general the bucket elevator type of unloading is much more economical on power consumption than air suction unloading although somewhat more labour is used. These unloading devices are well established in grain handling and nothing new is in prospect beyond continued small improvements.

Grain Handling Machinery. Elevator legs of the bucket type, mounted on rubber belting with cotton plies, are in general use for terminal elevators. The tendency to-day is to provide better driving mechanism and safety devices. Interlocks should be provided to cut off power in the event of a slow down in leg speed from a tendency to choke at the boot of the elevator leg or from any block in the flow of grain from the head spout.

For distribution of grain throughout terminal elevators, belt conveyors are used exclusively. They are equipped with troughing rolls throughout. Belt speeds are about 850 ft. per min.., though speeds up to 1,100 ft. per min. have been used. Such speed is not satisfactory, however, for some of the lighter grains. Capacities range up to 36,000 bushels per hour.

Grain Cleaning. Cleaning machinery is of three types. The screen type with air aspirations both at the feed and discharge ends is the oldest type and is still used. Disk machines with air aspirations on the feed ends are also used. The most popular cleaner to-day is the cylinder type, with indents to suit the various grains to be cleaned. This type is built in capacities up to 2,000 bushels per hour. Cleaning machinery is being improved continually. All-steel frames and anti-friction shaft bearings will soon be standard for such machines. Recleaning machines for reclaiming grain and separating screenings and railings are combinations of the three types already mentioned.

Grain Storage. Terminal grain storage bins should be designed for active storage and should not hold over 40,000 bushels per bin, and a variety of bin sizes is desirable in a storage unit. Reinforced concrete is generally used for the walls. Sliding forms are used, raised by screw jacks, and the concrete is poured continuously from the bin bottom to the top of the bin. On rock foundation bin heights up to 160 feet have been used.

The regular circular bin is best. These are often spaced a few feet apart and connected with contact walls, the interspaces being subdivided with other walls to provide a variety of bin capacities. In a terminal elevator the ratio of capacity between the working section and the storage section should be between 1/6 and 1/10.

Belt conveyors in the cupola with moveable trippers to distribute grain to the various bins, and similar belt conveyors in the basement to draw off the grain, provide for the distribution and handling of the grain. All bins should be fully hoppered and the tops enclosed.

Temperature recording apparatus is very useful in storage units, particularly in warmer climates. This is accomplished by suspended conduits containing electrical cable with thermocouples at intervals. All such thermometers are connected to a central control board and any temperature rise can be detected immediately and the grain cooled by drawing off the bin, re-elevating and filling again.

Temporary Storage. In 1940 when Canada was faced with carry-overs in excess of 500,000,000 bushels of grain, it was evident temporary storage of some sort would be necessary. Wooden cribs and plank bins were constructed adjacent to country elevators, and much was done on the farms to hold grain until elevator space was available. In all, about 75,000,000 bushels of storage space of this type was provided in Western Canada.

However, it was also necessary

to provide terminal storage. This was done during the summer of 1941, providing a total further space for 55,000,000 bushels at Port Arthur and Fort William adjacent to terminals, in addition to the permanent 95,000,000 bushels capacity there.

The temporary storages were built with concrete floors and a central concrete tunnel along the middle of this floor contained a belt conveyor for drawing off the grain. The side walls were of timber crib construction. The roof was supported on wood post towers, sloped at the angle of repose of the grain. At the roof peak a small cupola was built to contain a belt conveyor for filling the storages.

These sheds were 144 feet wide, and varied in length from 600 to 1,200 feet. The depth of the grain was 48 feet at the centre and 18 feet at the side walls. Each building held from 2,000,000 to 4,000,000 bushels. The total length of sheds built was about three miles. 60 per cent of the grain would flow out to the conveyor and the balance had to be moved by power shovels. The use of these temporary storage sheds lasted five years until stocks decreased. The sheds then were demolished and the material salvaged for housing projects. Such storage cost about 9 cents per bushel to build, including equipment and connections to the terminals. They were not expected to be cheap to operate, and cannot be recommended for permanent storage. The programme, however, provided safe storage in an emergency.

Some difficulty was experienced from infestation in the grain but the loss from such damage was less than 1/6 per cent. The grain had to be turned over about once every eight months to maintain it in good condition. Grain in temporary storage in the cold winter weather gave no trouble.

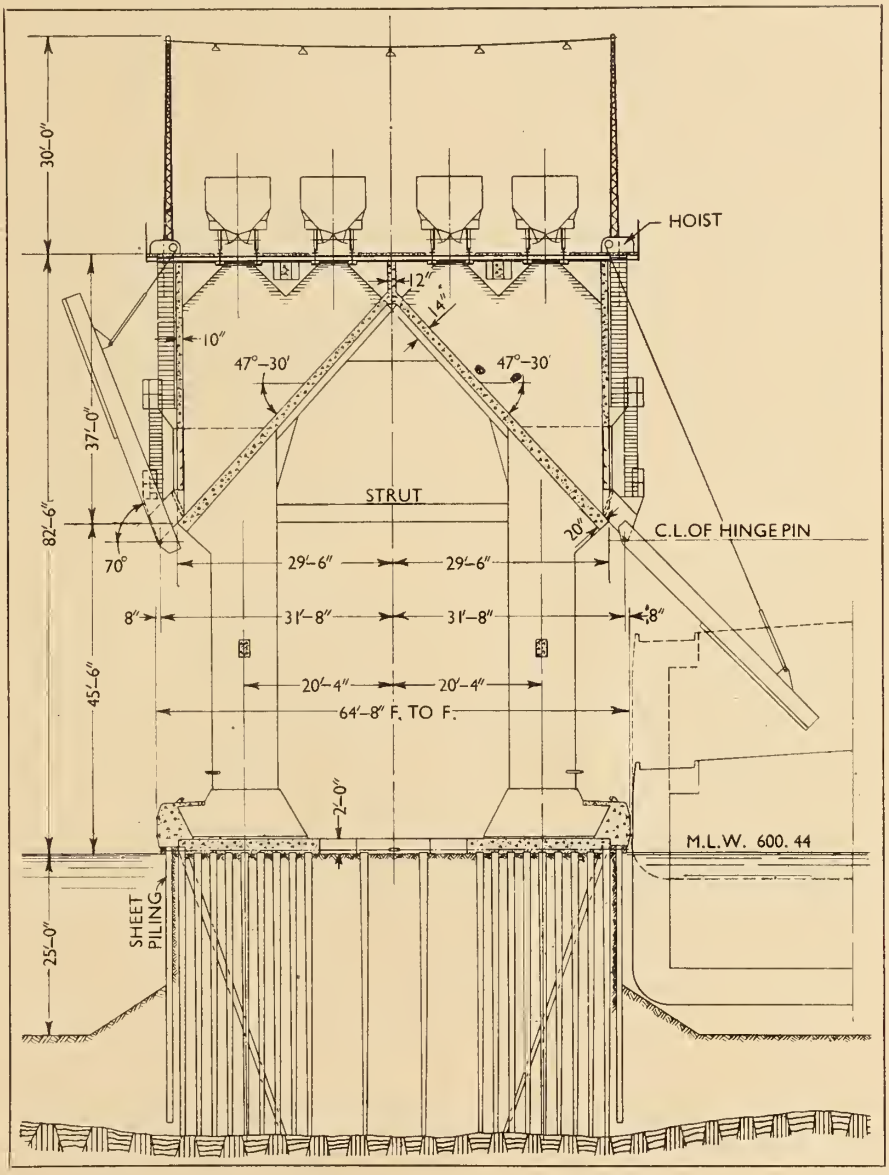
Grain Shipping. Shipping from the terminal is accomplished by direct spouts from shipping bins to vessels, or, if the wharf is remote from the terminal, by a belt conveyor system. Railway car shipments are directly spouted from the scales to the railway cars, the spouts having bifurcated ends to load without trimming the car. Sacked grain shipments are made at the wharf in sacking towers built into the shipping galleries. Bulk grain is discharged from the conveyor system to a bin below. This bin discharges to sacking machines, which in turn discharge to the wharf level for loading into the vessels with slings.

There are many elaborate systems of grain shipping galleries for delivery of bulk grain at ocean ports to vessel berths at transit sheds, making it unnecessary to move the vessel to load grain when other cargo is being handled. Travelling ship loaders have been devised to discharge bulk grain from overhead conveyor systems at any point throughout the length of the wharf, but their expense has never been fully justified.

Auxiliary Equipment. The dust explosion hazard in terminal elevators has always caused concern to operators. Of first importance is good housekeeping to remove daily the static dust on floor, ledges, and walls. The handling of grain produces dust and it is impossible to confine such dust at all points where discharging grain from spouts is loaded on to belt conveyors or placed in bins.

Dust control systems are now in common use and should become universal in all grain handling plants. These systems mean the application of air suctions at all points in the terminal where dust may be liberated into the atmosphere, and the collection of all this dust by means of air piping, with traps to remove any grain or heavier material, and fans and dust collectors to remove the lighter material from the air volume. With the dust control system in

Fig. 4. Cross-section of a typical pocket ore dock.



operation the housekeeping problem is simplified and the reduction of suspended dust reduces the explosion hazard.

The custom of removal of tramp iron from grain as received in terminals will probably become general. Iron can be very troublesome, damaging equipment and also increasing the explosion hazard through sparks from such metal striking concrete walls, or metal spouts and hoppers. Suspended electro-magnets over receiving conveyors can be devised to pick up all metal from the grain stream. If the magnet is covered with a moving belt, it can be made self-cleaning. These devices are not commonly in use, since the cost of installation is somewhat high.

Individual electric drives are now the rule in modern elevator design. All electrical apparatus should be dust tight and electrical interlocks used in the various drives to prevent human error in operation and to safeguard equipment from overloading or choking. Electric signal and telephone communication throughout the plant is becoming more complete and is a great aid to efficient operation.

Iron Ore Handling. The handling of iron ore on the Great Lakes is an example of the high efficiency and low handling cost that can be achieved over a long period of years where a high continuous volume is present. This handling method is developed from a combination of special bulk freight vessels, railway cars, gravity loading systems, and large mechanical unloading units.

The bulk freight vessels are standard, with hatches at 24-foot centres and no partitions in the hold, making a continuous cargo space fore and aft. Cargoes up to 18,000 tons are carried.

The railway car is of special design, hoppered to a central gate at the bottom and 24 feet in length. Capacities of ore cars range up to 75 tons, though 50 to 65 tons is the usual range.

The high level pocket ore dock, for transfer of the ore from cars to vessels, is a special development from the early days of the iron mining industry in Minnesota. The cross-section of a typical pocket ore dock is shown in Fig. 4. The top of the dock is about 8 feet above water, with four tracks which connect with the railway yards by tracks on trestles. The ore cars are shunted to the top of the dock from the classification yards. The dock pockets or bins are spaced at 12-foot centres and hold from 300 to 400 tons of ore. The cars are emptied directly into the pockets, each car registering on every ore pocket.

At the bottom of each pocket a gate and chute is located, operated by an individual two-drum hoisting winch on the top. The ore chute can be lowered into the hatches of the vessel and the whole pocket discharged in a matter of seconds.

A new development in the unloading of ore cars is a 5-ton shakeout. This is a weight placed on top of the car, having a motor and eccentric to produce rapid vibrations of the weight. This is proving effective for removing caked ore from the cars, and is a great labour saver. It is useful also on any sticky bulk material in hoppered cars.

Coal Handling. There are many well-established varieties of coal handling devices. One war-time development may be of interest. It was necessary to stockpile large quantities of coal at central steam electric stations and manufacturing plants to insure continued operation in case there was an interruption in coal deliveries. Danger of fire in coal stockpiles of any size has been a common trouble and various means of ventilating and limiting the depth have been set.

Recently coal has been stockpiled, after crushing, by ordinary road building machinery — the surface of the pile being sealed by packing fine coal with the heavy treads of the machines, or coating with a sealing compound. Stockpiles 100 feet high were built up in such a manner.

The self-unloading type of bulk freight carrier is used to a large extent on the Great Lakes for coal, limestone, and other bulk materials. The holds of the vessels are hoppered to two tunnels. Here the material is drawn off to conveyor belts, or dragged by scrapers which discharge at one end to an elevating device. The main advantage in this type of vessel is the handling of bulk freight to points where no unloading facilities are available.

The use of belt conveyors for all sorts of handling of bulk materials is now quite common, and should be developed to a much greater extent in the future. The loading of ore, limestone, coal, and any coarse bulk material can be done economically and rapidly entirely with belt conveyors. Lump material up to 12 inches in size can be handled without undue wear and tear on equipment. The belts used for handling large lump or abrasive material are generally of cord construction with a heavy rubber cover, having an overall thickness of ⅞ inch and widths up to 60 inches.

Conclusion. The whole subject of material handling is so closely connected with unit cost of material handled that in any particular problem the choice of equipment is decided by economic rather than by technical considerations. It is not a matter of what is the best and fastest type of equipment to do the work, but what it will cost per ton or bushel, including both the capital and operating costs.

There are three main principles to be studied in an approach to any material handling problem for selecting the method and equipment to be used. In the first place, capital plus operation cost per unit handled should be at a minimum. Secondly, the rate of handling per hour or per day should not exceed five times the average rate on a seasonal or annual basis. If it does, then the cost of the higher speed equipment will be out of proportion. Finally, the flexibility of the method and equipment to be used should be determined from the expected number of different types of carriers using the facilities.

While the above principles should be broadly considered, I believe they can be applied to any particular problem.

MECHANIZATION OF THE FRANKLIN MINE

by

David G. Burchell

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A paper presented before the Maritime Meeting of the Engineering Institute of Canada, at Digby, N.S., September, 1948

The Franklin was the first coal mine in Canada to adopt mechanical loading at the face, using shakers and duckbills. This paper tells how the equipment is set up and how it works. The continuous system of coal extraction used in this mine is explained, and its advantages over the older, more commonly known method, known as the parallel room system, are assessed. The cycle of operations is explained and reasons given for the choice of certain types of equipment. The electrical layout is described, as well as how time studies and labour cost records are kept. The losses and gains from using mechanical loading are weighed. In conclusion the author shows how, by increasing production, mechanization tends to increase wages.

The Franklin Mine of the Bras d'Or Coal Company, Ltd. is situated at Bras d'Or in Cape Breton county, Nova Scotia, and is located near the western edge of the Sydney coal basin. The mine is on the main line of the Canadian National Railways three miles west of Sydney Mines. The operation is carried on in a 42 in. seam, locally known as the Sullivan or Edwards, and lies 350 ft. beneath the Sydney Main or Harbour seam. Entrance to the mine is by means of a pair of slopes, bearing North 25° 30′ East, and dipping ten percent seaward. At the present time the slopes are some 6,000 feet in length. The coal is a high volatile bituminous, Class A to B; it is one of the lower seams in the basin, and contains a considerable quantity of impurities. The mine plant is designed for an output of 700 tons per day. At the present time we are producing 500 tons per day.

There are a great number of washouts in the seam, as well as quantities of iron pyrites in certain sections of the mine. These washouts vary in thickness from a few inches to 18 feet and possibly more, and usually replace the coal to the full height of the seam. These washouts are of great interest to geologists. From an operating point of view they present one of our most difficult problems and a great hindrance to the mechanization of the loading operation.

Introduction of Mechanical Loading

Some eight years ago when this mine was projected it was decided to experiment with some type of mechanical loading, because of the increasing cost of production. After due consideration of the various types of equipment available, it was decided to use shakers and duckbills. Thus, this was the first mine in Eastern Canada to adopt a system of mechanical loading at the face. You will note that the term mechanical loading is used rather than mechanization. The term "mechanization" is rather a loose one when used in connection with the mechanical operation of the various units in a coal mine. Strictly speaking the terms "mechanical loading" and mechanization are not synonymous, though they are sometimes used in that sense. Practically all the various operations carried out underground in the getting of coal have been mechanized for some years in the Nova Scotia mines with one exception, that of the loading coal at the face.

There are various methods of loading coal mechanically in underground mines. Probably the simplest method and certainly the most satisfactory under certain conditions is known as "duckbill mining". All means of mechanically loading coal are merely methods for reducing the amount of physical labour required. Shaker conveyors have been used for years for transporting the coal from the working face to the transportation system. In most cases coal is hand-loaded from the floor onto the shaker conveyor, and duckbill mining is merely this older method of transporting coal brought up to date. This is done by the addition of a self-loading head, or "duckbill". The duckbill was originally developed in Germany in the early "twenties", but did not prove successful until the idea was transmitted to this side of the Atlantic, where it was developed by the Union Pacific Coal Company in the United States. This company developed the apparatus to a point where the manufacturers of mining equipment felt it was a sound and practical idea. The patent rights were obtained by the Goodman Manufacturing Company of Chicago, and they are today still the only manufacturer of this type of equipment. (Fig. 3)

Any mechanical device used to load coal is a means of supplanting the human muscles for getting the coal off the floor into the transportation equipment. A man can lift so much and no more. He can load more tons of coal on a low conveyor, because the lift is less, than he can in a mine car two, three, or even four feet high. If the lifting operation is eliminated, the man can produce more coal with less effort.

The Duckbill

Duckbills are particularly adaptable for thin seams and for mines having heavy, tender top conditions which require close timbering. A duckbill is a self-loading head, attached to a shaker conveyor. A shaker conveyor consists of troughs or pans of steel, supported a few inches off the mine floor by cradles and to which backward and forward motions are supplied by a reciprocating engine or drive. The engine can be driven by any suitable means, such as compressed air or electricity. If an electric motor is used, it must be fitted with a fly-wheel. A differential motion is usually necessary on shaker conveyors, particularly if the conveyor is to move the coal on the level or against a slight grade. In most cases the drive is provided with means for adjusting the number of strikes per minute. Experience determines what length of stroke is best suited to the particular conditions of the individual mine. Our engines run at approximately 74 strokes per minute.

The differential motion provides a quick backward stroke and a slower return or forward motion, thus the quick backward stroke overcomes friction between the coal and the conveyor trough, and permits the trough to slide under the coal. The coal then remains where it was relative to the mine floor, but the slower forward stroke of the conveyor carries the coal with it, because it is not fast enough to overcome the frictional grip of the coal on the conveyor. Thus with each stroke the coal moves forward about six inches or roughly thirty feet per minute. This combination of slippage on the backward stroke and movement on the forward stroke causes the coal to advance along the panline, where it is received into the mine car or other transportation medium.

The duckbill itself (Fig. 2) is merely an addition to a specially designed shaker trough in the shape of a shovel like projection. This duckbill or loading head is made of cast steel, so designed that it can be pushed under the coal which has been shot down, and haul it back into the panline. The special trough connected to the duckbill is 15 feet long, and contains a companion trough of slightly larger size, which fits underneath the duckbill trough. This combination, known as the telescopic trough (Fig. 1), is used so that the duckbill can be moved ahead or back without disconnecting it from the panline proper.

Just behind the rear end of the telescopic trough and fastened to

Fig. 1. Rear view of Duckbill showing telescopic trough.

Fig. 2. Duckbill loading at face.

it, is a swivel joint (Fig. 3), by which means it is possible to swing the duckbill through an arc of some 40 degrees, to right or left of centre. When the face has been cut and the duckbill is set up ready for operating, the telescopic trough is in the short or closed position. As the duckbill works towards the face and cleans up the coal which has been shot down, the telescopic trough is gradually extended. When a point is reached where the trough is fully extended the panline is disconnected behind the swivel, the duckbill and swivel move forward the length of a pan, and an additional length is inserted. The panline is then bolted and the apparatus is again ready for an additional advance of ten feet. If the grip blocks are released on the backward stroke and tightened when on the forward stroke, the duckbill will move toward the face at a rate equal to the length of the stroke of the engine. On the other hand, by reversing this operation, the duckbill is retracted or moved back from the face. This operation is automatic, it being only necessary for the operator to move the operating lever either forward or backward, depending on which way he wishes to move the duckbill.

Fig. 3. Assembly of a Goodman Shaker Conveyor.

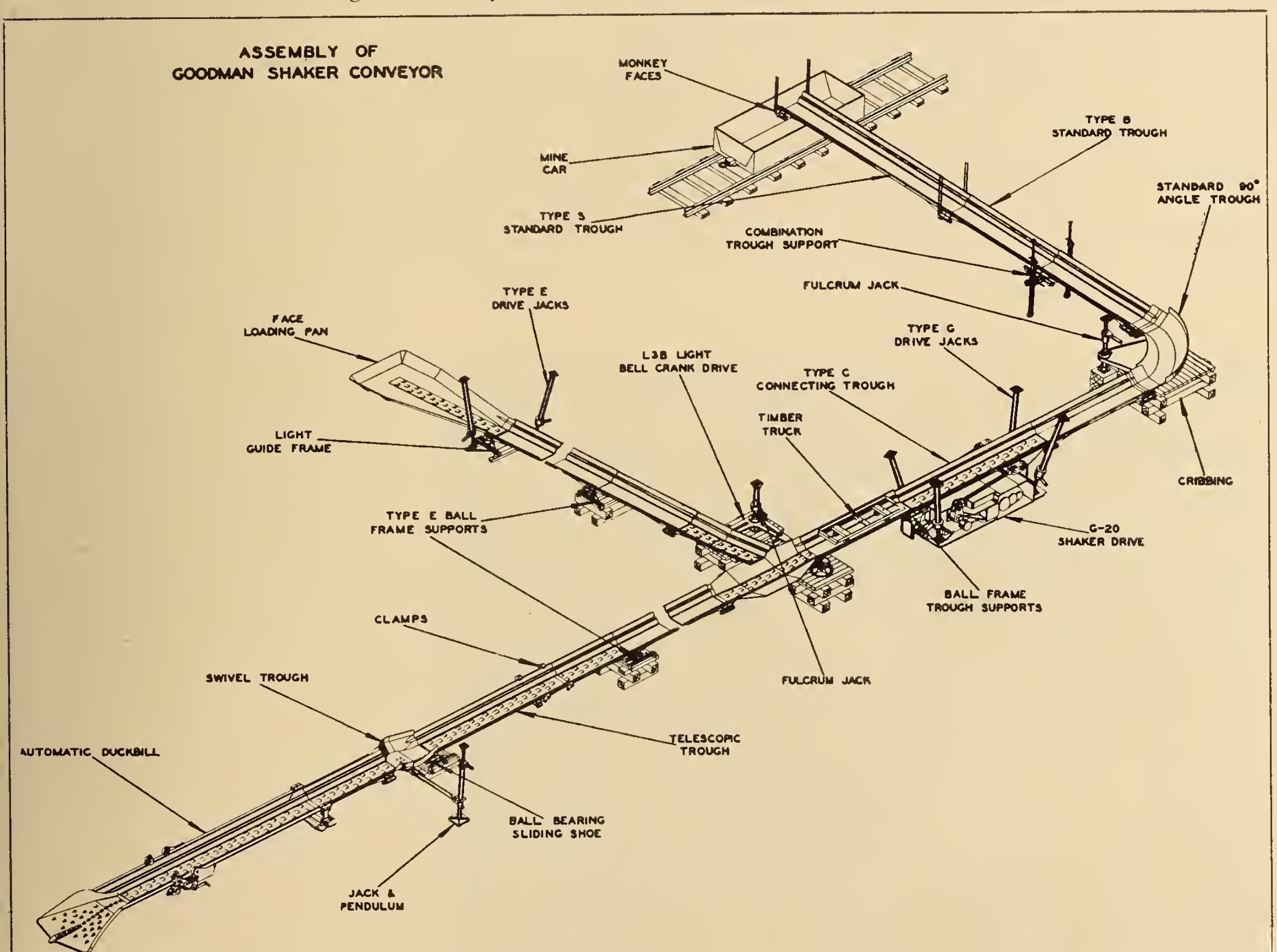


Fig. 4. Discharge end of level conveyor belt.

Method of Extraction At Franklin Mine

At the present time we are following a method of extraction known as the continuous room system. From our main slope driven on the pitch of the seam we develop triple entries, which are three parallel levels, driven at right angles to the main slopes. Our present equipment allows us to drive these entries approximately one-half mile in length, and with additional conveyors it would be possible to drive them much further. These three entries or levels are fourteen feet wide and separated by a pillar of thirty feet. The centre or main entry is known as the Belt Level, and here the 30 inch conveyor is installed. (Fig. 4) The right hand or low level is used to conduct the fresh air into the working faces, and to carry the power cables, while the upper or high level is developed to provide sufficient space to set up the shaker drives, so that the coal can be discharged onto the conveyor belt in the centre level. It also provides a return airway.

These levels are driven in solid coal, so that there is a block at least 900 ft. in width to the left or high side of the levels. This is a block of coal that will be worked out by the continuous room system. Such a block contains roughly 125,000 tons, and provides about one year's operation for the mine. When the levels have been developed a suitable distance and the conveyor belt set up, four or five shaker conveyors are then installed in the roomnecks provided by the development of the high level. It requires 50 feet to set up the drive and duckbill. These shaker conveyors with duckbills then proceed to extract the coal uphill and advance for a distance of about 325 feet, as shown on Fig. 10. The rooms are 21 ft. wide and there is 21 ft. of solid coal left between each pair of rooms. When the shaker units have reached a distance of 270 feet, as shown on the plan, they are turned both right and left and crosscuts are driven.

After making the crosscuts, the shakers continue until a distance of 325 feet is reached. This provides room to set up again after the lateral belt is installed. At this point two more belt conveyors are set up. The headway belt, shown in the right hand room on the plan, is approximately 300 feet long. The lateral conveyor is then installed in the series of crosscuts made at the top of the room. At this time the shaker units are moved uphill to the beginning of the next room. The coal is then loaded directly from the shakers onto the lateral belt, which in turn delivers it to the headway belt and it is then transported down the grade and finally discharged on the main conveyor in the level. (Fig. 8) When the second lift has been worked out the operation described above is repeated, the headway belt being extended an additional 300 feet.

There are considerable advantages to be derived from this continuous room system of mining, over and above that of the older and perhaps more commonly used method, which is known as the parallel room system. In the parallel room system, rooms are driven a distance of 300 feet, after which the shaker conveyor and all the other equipment is withdrawn from the room, moved in the level and set up again to drive another series of rooms parallel to the first ones. It is necessary to make new setups every eight or ten days. In making this type of setup the duckbill must be dragged 300 feet from the room face down to the level, turned at right angles, moved 40 feet along the level, turned at right angles again and set up to make it ready for the next operation. In close timbering this is an extremely difficult operation, because of the length of the duckbill and the space required to negotiate two close right angle turns. In the continuous room system, after the first set of rooms has been worked out, it is only necessary to pull the shaker drive 300 feet up the hill, set it up and all the other equipment is already there ready for operation again. Considerable time and a great deal of expense is thereby saved.

Another important point, and one which probably caused us to change to the continuous room system about a year ago, is the problem presented by stowing stone from the stone troubles. In parallel rooms, if a stone trouble is encountered a short distance from the level, and if there is not sufficient stowage room in the room itself, this stone must be loaded and hoisted to the surface. In the continuous room system, after the first set of rooms has started away, should stone be encountered in any place along the 900 ft. length, it can be stowed in the old rooms, without the necessity of loading and hoisting it to the surface.

A series of three belt conveyors is used to transfer the coal from the delivery end of the shaker conveyors to the mine car on the main slope. These conveyors are all 30 inch and run at a speed of 200 feet per minute. The belts are carried on ball bearing type idlers, some of which are equipped with "sealed for life" ball bearings.

The main level belt, sometimes called the "mother conveyor", is 2,400 ft. in length, and extends in from the main slope. Running at right angles to this belt and up the pitch is a second conveyor 600 ft. in length, known as the headway belt, which is moved in the level as the extraction of the rooms is completed. Reference to the plan will show the layout of these conveyors. The third, or as we call it, lateral belt, is of a lighter construction and is set up at the top of a series of break throughs at the room ends, as shown on the plan. This belt has to be moved every ten days or so, and for that reason is purposely constructed of a portable nature.

The three conveyors and all the shakers in the section are interlocked from an electrical standpoint. The control of all these electric motors is vested in the operator at the loading head or discharge end of the level belt and by means of a push button, he can stop or start all the equipment in the section. Starting at the face, the shaker conveyor is controlled through a rotary or centrifugal switch, which is installed on the underside of the lateral conveyor belt. If the conveyor belt is stopped, the shaker cannot be operated. You can see the reason for this, because the men at the face, being as far as 300 feet from the lateral or level belt, are unable to know whether the belt is running or not; thus if the control of the shaker were in the hands of the facemen there would be a great deal of spillage on the level.

The lateral belt is, in turn, controlled by a similar switch installed in the headway belt, and headway belt is also controlled by the same arrangement on the level belt. Thus the operator can stop or start all the units at will. Theoretically these belts should not stop, however, there are occasional delays such as a shortage of cars or some mishap, which makes it necessary for the loading head operator to stop everything in the section. Normally, however, these belts run continuously for the eight hour shift. By means of a remote control push button, the facemen are able to stop or start their shaker conveyors at will, provided however, they are only able to start their shaker if the belts are running. These rotary switches are so adjusted that they operate immediately the belt's speed drops about 10 per cent.

Cycle of Operations

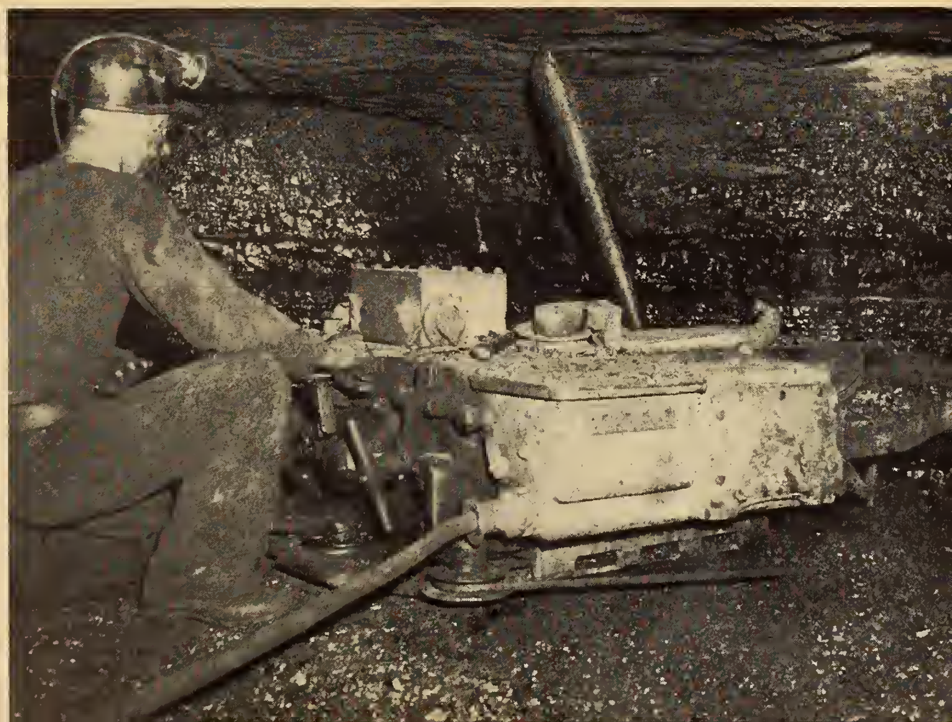
All the equipment is operated two shifts. On the third or eleven o'clock shift the conveyor belts are reversed and material, such as timber, pan line accessories etc. are brought in and distributed to the working faces, so that in the morning when the mine starts operating, a complete supply of materials is on hand to carry them through two successive shifts. One of the greatest difficulties in conveyor operation is training the conveyor belts so that they will track properly in reverse as well as forward direction. It is absolutely essential that the conveyors be properly installed, and to assure a perfectly straight line they are lined with the transit by the engineering staff.

Any number of room shakers, up to the capacity of the belt, could be worked in a section of this design. We are presently using five shakers in the room section. Each crew consists of three men, who perform all the necessary mining operations. These consist of cutting, drilling, shooting, loading, timbering and extending the conveyors. Each room is equipped with a shortwall coal cutter, post mounted electric drill, electric fan or blower for ventilation, duckbill and shaker and the necessary hand tools. The auxiliary fan is located at the room neck and provides a suitable current of air to properly ventilate the place for safety.

The cycle of operation at the face (Fig. 6) begins with the undercutting. The shortwall, which is equipped with an eight foot cutter bar, starts cutting on the right hand side of the 25 ft. wide place. This machine is operated by one man. When he has cut a few feet, the second begins drilling, while the third helps the other two or prepares the powder and stemming for the shooting. By the time the face is undercut the drilling is also completed, and the third man has prepared the break-in or snub shot for firing. This is fired, providing coal for the duckbill to start work. As soon as one side of the room is cleaned up, the shortwall begins cutting again and, when space is provided, the drilling operation goes forward as before. At this point, all three operations are being carried on simultaneously.

Shortwall mining machines (Fig. 5) are used for undercutting the coal. We have tried various types of undercutters and have found the Goodman "512" the most satisfactory. Our later machines have 8 ft. cutter arms and the earlier ones are 6 and 7 feet. We have now standardized on 8 ft. This gives an increase in the rate of advance and consequent output. The latest addition to our mining machines is the installation of "bugdusters", which device cleans the slack coal made by the cutter bar from underneath the kerf, and piles it in a neat row behind the machine. Blasting is done with

Fig. 5. Shortwall coal cutter.



Monobel No. 14, a permitted explosive, and electric detonators.

We have tried almost every type of cutter bit that has been developed. To date we have not been able to find any type of bit as satisfactory as the old standard 1 in. x ½ in. forged steel bit, which is resharpened until it is used up. We carried on extensive experiments with tungsten carbide tipped bits, but did not obtain a satisfactory cost due to the preponderance of sulphur balls or "dogs" in the coal, which had a tendency to chip the tungsten carbide from the shank. These tungsten carbide tipped bits cost in the vicinity of $5.00 apiece, so it would not be economical if too many of these had to be discarded. This cost per bit compares with about six cents for the standard type. At the time the initial cost of tungsten carbide bits was $5.00 each, and the cutting cost ran in the vicinity of 13 cents per ton. This compares with the standard cutter bit, which costs about 6 cents each, and gives a cutting cost per ton of slightly over 3 cents. We have also tried tipping the standard coal cutting bits with Borod and other hard-surfacing materials, but the results obtained did not justify the original expense. Some years ago we also tried several types of throw away bits, with results that were not encouraging.

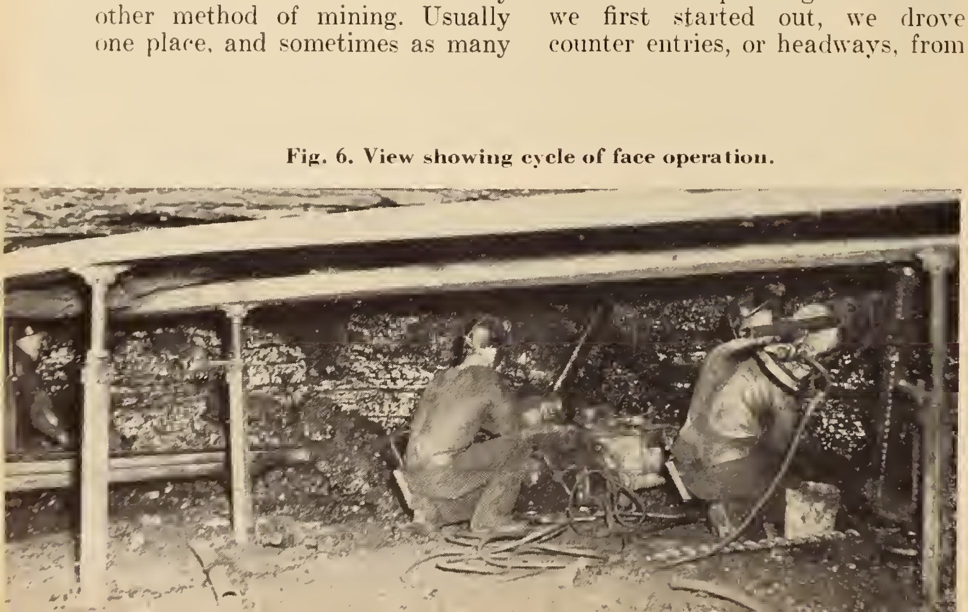
Under favourable conditions it is possible to make three complete cleanups in an eight hour shift. However, three cuts are not usually attained because of exceptionally heavy roof, hard cutting, or the stone troubles which were mentioned earlier. The average tonnage produced per shift is 37 tons per place, or slightly over 12 tons per man at the face. This is not a high tonnage for mechanical loading. However it is considerably better than could be obtained under any other method of mining. Usually one place, and sometimes as many as three, produce no coal for one, two or three successive shifts, because of the prevalence of stone troubles. When these washouts are encountered in the rooms, the place is narrowed to about ten feet, and the stone so produced is stowed along the ribs of the room. Thirty seven tons per shift is an overall figure, and includes all the shifts that were spent in non-productive stone work. If the time spent in stone work were cast out, the tons per shift of actual coal produced would be increased to 48.

The roof is tender. Great care is necessary to hold this tender top, and 3 in. x 10 in. white oak cross beams are used to support this, set on three or more steel jacks. Adjustable jacks are used rather than timber, because they have to be moved from time to time to allow the duckbill to be shifted across the face as loading progresses. After the face has been cleared up, or at some convenient time, two or three men replace the temporary oak cross beams and jacks with twelve ft. black spruce booms and permanent timber. A closely supervised plan of timbering is followed This system of timbering has caused a large reduction in the number of accidents caused by roof falls.

When the coal comes out the level on the conveyor it is discharged into 2½ ton steel drop bottom mine cars, (Fig. 7) and hauled to the surface by an electric hoist. At the present time this hoist is a 150 hp. single drum, and contains 6,000 ft. of 1 in. plow steel rope. The hoisting speed is 600 ft. per minute. Four cars make a trip. A larger hoist is ready for operation as soon as output warrants its use.

There is little doubt in our mind that the continuous room system is the most satisfactory method of working shaker conveyors and duckbills in a pitching seam. When we first started out, we drove counter entries, or headways, from our main entries or levels, and from both sides of those worked the rooms on the strike of the seam. We soon found that due to the 10 per cent pitch, it was almost impossible to keep the duckbill from sliding towards the low side of the room. In order to overcome this it was necessary to use the tail rope of the mining machine to hold the duckbill in position at the face for loading. This worked very well, but, we soon realized that when the mining machine was being used to retain the duckbill in the proper loading position, it could not be used for cutting the face and we were, therefore, unable to carry out a satisfactory face cycle, viz., cutting, drilling and loading simultaneously with a certain percentage of overlap on each operation. We eventually revamped our entire operation to a plan known as the continuous room system. This system is used to some extent in the United States, but is not common, as it is seldom necessary to overcome such difficulties as we have in the Nova Scotia coal field.

Fig. 6. View showing cycle of face operation.



Electrical Equipment

The Franklin Mine is completely electrified. Current is transmitted from the switchboard of the Eastern Light and Power Co., Ltd. in Sydney, a distance of about 20 miles, at 23,000 volts. The utility steps down this voltage to 2,300 and delivers it on our property, where we carry it underground by means of a borehole and submarine type armoured cable. The current is then transmitted underground at 2,300 volts to the various working sections of the mine, where it is further stepped down to 550 volts. Approved type oil circuit breakers and pyranol filled transformers are used in the operating section of the mine. The 550 volt current is transmitted by means of wire armoured cable through Mavor and Coulson junction boxes to the working face. The various machines at the face, such as coal cutters, drills, etc., are then plugged in these junction boxes by means of an approved type plug and the current is carried to the machine through flexible cab type three conductor trailing cable.

The flameproof oil break switchgear carries the Buxton certificate, and is used on all secondary circuits. These circuit breakers are fitted with all necessary protective devices for the circuits, such as over-current protection, which is provided on all three phases, and is in the form of series wound solonoids. Under-voltage protection is also given by means of a release, which has an under-voltage action and operates within fine limits. The flameproof junction boxes, or cable couplers, are of heavy cast iron construction capable of carrying 200 amps. at 550 volts. These are used for joining the submarine type cable and are also fitted with plugs for mining machines or drills. The plugs are of an approved type and cannot be removed from the socket, without first breaking the circuit.

Electrical control of the various units can easily become too complicated for efficient maintenance. It is important to keep it as simple as possible. The three conveyors and all the shakers in the section are interlocked, and the control of all these units is vested in the operator at the loading head. The headway and lateral belts are further controlled by means of a roller switch, actuated by the forward motion of the belts themselves. The shakers are also controlled by similar rotary switches installed in the lateral or headway belt as required. Thus, when the level belt is started by means of the push button and magnetic switch and it reaches a pre-determined speed, the roller switch closes the circuit and starts the headway belt.

Similarly, when the headway belt gains speed it closes the circuit on a roller switch which starts the lateral belt. When the lateral belt gets up to speed, the roller switches close the circuits and it is then possible to run any number of the shakers which are discharging onto this belt. In stopping, the reverse operation takes place so that the shakers stop first then the lateral belt, followed by the headway belt and finally the level belt. This sequence is purposely arranged to prevent spillage. If, for any reason, such as car shortage, it becomes necessary to stop the level belt, the operator at the loading head has definite control of all the loading units. Each room shaker is fitted with a push button at the face, by which the individual shaker can be stopped. It can only be started again provided the belts are all running.

This control system worked very well but had one weakness; it was not possible to stop either the lateral or headway belt in an emergency, except from the loading head. We developed and built in our shop a rather ingenious stop, start and reverse push button station, that can be operated at any point along the headway by means of a pull wire. This serves as an emergency stop and is also used to control the belt when taking in materials on the 11 o'clock shift. This control consists of a permissible push button station, fitted with a shaft arrangement containing two four-position cams. These are rotated by means of a ratchet wheel and lever which in turn, are operated by the pull cord at any position along the headway or level.

Fig. 7. Loading mine car at end of conveyor belt.

Operating Practice

The mine is ventilated with a Jeffrey Aerovane two stage fan which delivers 26,000 cu. ft. of air per minute against a pressure of 1.3 inches of water. This fan is installed in a concrete fanhouse on the surface and is driven by a 25 hp. electric motor. Emergency power is provided by means of a Ford V-8 motor, used in case of power failure. Permanent stoppings in the main intake air course are of brick or concrete. Temporary stoppings in the levels are made of double boards with brattice cloth between the two layers.

The drainage system is simple. A lodgment capable of holding about 10 days' water is provided 3,000 ft. from the mouth of the slope. Just below this is installed a 250 Imp. gallon per minute centrifugal pump made of Krupp stainless steel and is not harmed by the mine water which, in many cases, is extremely hard on bronze. The pump discharges the water through a vertical borehole, 365 feet in length and is operated normally eight hours out of the twenty four. Thus sufficient reserve capacity is available in the event of extraordinary water conditions. Much mine water is due to surface seepage. This is particularly true in mines where the coal was worked close to the outcrop. Because this was guarded against in developing the Franklin mine, the water is not unusually heavy, being about one ton of water pumped for each ton of coal hoisted.

When coal reaches the surface it is dumped in a hopper underneath the bankhead, from where it is fed to a 42 inch steel apron conveyor by means of a reciprocating feeder. This apron conveyor travels at a rate of 50 ft. per minute and is used as a picking belt. A number of men are employed on each side of this belt to pick out bits of rock and stone. After the coal has had the larger pieces of rock and impurities removed, it is elevated to a point where it is discharged on a vibrating screen, which separates it into various sizes. The run of mine coal is first separated into two sizes: lump and 1 in. slack. The lump coal is then further divided into 2 in. x 1 in. nut and plus 2 in. lump. The 1 in. slack is then further sub-divided into stoker and fine slack. These four sizes are presently being produced, and the stoker and nut sizes are treated with oil to make them dustless. The

Fig. 8. View looking along main level showing belt conveyor.

slack and stoker coals are carried on a rubber belt underneath a high-powered electric magnet, which effectively extracts all bits of tramp iron such as spikes, nuts, etc. This is a necessary precaution in the preparation of a satisfactory stoker fuel, because tramp iron, if not eliminated, will cause a great deal of trouble in shearing stoker pins.

Time and Cost Studies

After taking a considerable number of time studies and compiling the information obtained, we discovered that most of the delays were caused by faulty managerial methods and poorly planned work, rather than by deliberate and unintentional delays by the workers themselves. The Time Study Engineer must be a man of exceptional tact. As a rule, workers resent the fact that management employs a man to observe their every move. Under these conditions some men tend to show off, as it were, and work exceptionally hard when the company time study engineer is making a study of his work. On the other hand, some other individuals take the opposite view and work as slowly as possible, hoping perhaps by so doing, that they will be able to establish a lower standard of work requirement. The engineer soon is able to evaluate these different types of workers and is thus able to throw out or discard data which would tend to create a wrong conclusion. We did find, however, that as soon as the workers realized that the purpose of time studies was not to try to get them to work harder in order to produce more coal, they did co-operate.

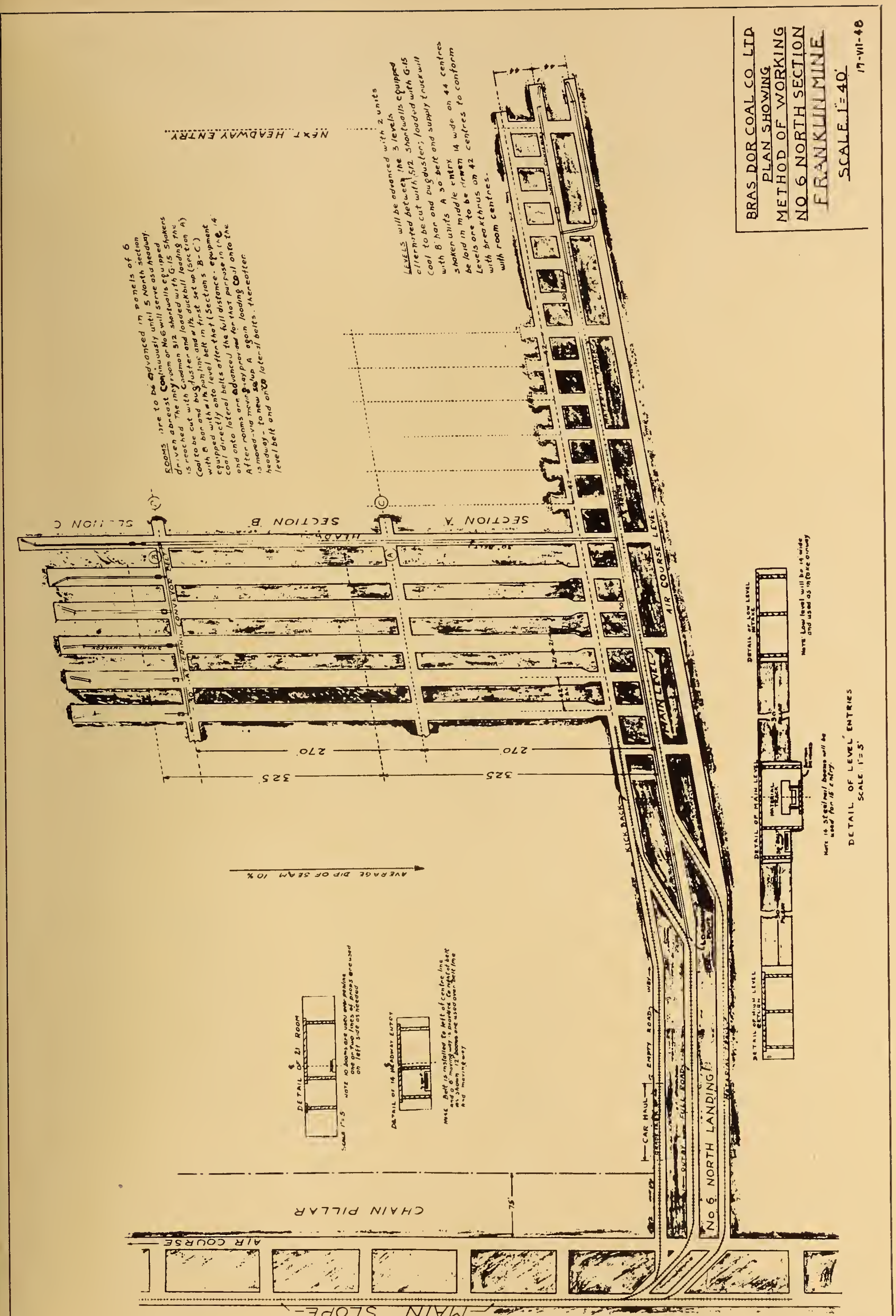
Daily labour cost sheets are kept, so the management can see the daily labour cost as well as the total labour cost to date on any one day. So far we have not attempted to keep daily material costs, as this is somewhat complicated in order to get accurate results. Labour cost is by far the greatest proportion of the operating cost, and is the one item which requires closest scrutiny. Costs, other than labour, are kept on a monthly basis.

One of the most important factors in an operation of this type is the efficient organization of the supervisory and maintenance forces. Regular routine inspections are made of all mechanical and electrical equipment and the results are reported daily on inspection forms — the idea being to detect and if necessary replace worn or faulty components before they can cause a breakdown, with consequent interruption on the working shifts. Repairmen are employed for this work on the eleven o'clock shift as it is difficult, while the equipment is in use, to make repairs without causing delays.

Losses and Gains Through Mechanical Loading

Mechanical loading, if it is to be successful, requires careful design and consideration for many auxiliary operations in addition to that one operation of mechanical loading. Perhaps the most important is transportation. Without adequate and continuous facilities to keep the coal moving from face to surface, any mining plan is doomed to failure. The efficiency of any loading machine is predicated on its ability to operate with the least possible number of delays. It is necessary to have a supply of empty cars at all times. All the shakers and belts in the section are connected by means of an electrical interlock, under the control of the man at the loading head. That one push button stops

Fig. 9. Headway belt discharging on level belt.


BRAS DOR COAL CO LTD
PLAN SHOWING
METHOD OF WORKING
NO 6 NORTH SECTION
FRANKLIN MINE
SCALE 1"=40'
17-VII-48
NEXT HEADWAY ENTRY
SECTION A
SECTION B
SECTION C
MAIN LEVEL
AIR COURSE LEVEL
KICK BACK
AVERAGE DIP OF SEAM 10%
270
325
CAR HAUL
EMPTY ROAD
No 6 NORTH LANDING
CHAIN PILLAR
AIR COURSE
MAIN SLOPE
DETAIL OF LEVEL ENTRIES
SCALE 1"=5'

or starts three conveyor belts and five shakers in sequence. The absolute necessity for eliminating every possible excuse for stopping the conveyor belt at the loading head is thus obvious. Mechanization also requires more mine cars, as it is not possible to load cars as fully from a conveyor as by hand. Thus more mine cars must be available and the mine transportation system geared to handle more mine cars for a given output.

There are many other factors which must be given detailed study before installing a system of mechanical loading. The introduction of additional mechanical equipment will increase the per ton maintenance cost and, by the same token, power consumption will also be increased. Consideration must be given the quality of the coal produced, because the introduction of mechanical loading will increase the percentage of small coal, which will result in an overall reduction in the sales realization. This is of prime importance for coal that is sold in the domestic market, as large coal usually brings a premium from the householder with hand fired furnaces. Furthermore, we must remember that a mechanical loader is not able to differentiate between coal and impurities, such as stone, and therefore mechanically loaded coal will contain more impurities, which must be removed in the cleaning process on the surface.

On the other hand, there are advantages to be gained with the introduction of mechanical loading. It is possible to concentrate all the mine workings in one or two sections of the mine, and thereby effect considerable savings in the labour force required in such auxiliary operations as transportation, maintenance and so on. Concentration of workings is possible, because the advance per shift is greater, and therefore fewer places are necessary to obtain a required output. We must not lose sight of the fact, however, that if concentration is carried too far and we expect to get all our production from one or two sections, a delay or breakdown will affect the daily output, perhaps to a point where we would not get any coal at all. This could occur from failure in a main line belt conveyor.

Such delays must be guarded against by more stringent inspection and maintenance of equipment. The more fully a mine is mechanized, the greater the amount of capital required for investment in the property. It is almost a foregone conclusion that mechanization of the face loading cycle means double and possibly triple shifting. Workmen have to be trained to become machine-minded. Considerable training is required, because it is necessary to change the workmen's habits so that they will get away from the old idea of hand loading, in which only one complete cleanup is made in a shift. The introduction of machinery makes it imperative that the equipment be used for the full eight hour shift.

What then are some of the major economic implications of mechanization? The ultimate aim of mechanization is the reduction of cost. Labour costs, which represent about sixty percent of the cost of production, have been steadily rising; these along with increased cost of materials, make it more than ever necessary to find some further methods of cost reduction. The next step must be mass production, and until mass production of coal is achieved the ultimate aim cannot be fully attained. Mechanization, as it is today, has not reached the status of mass production—it is merely a patch work arrangement, an intermediate stop as it were, on the road towards that end. Actually, all mechanization has accomplished so-far is the substitution of machinery for manpower.

Mass Production Means Higher Wages

To make true progress, mechanization must produce or cause mass production of coal. Successful mass production means continuous production in vast quantity, with a very minimum of operating motion. The answer is perhaps some form of continuous mining, whereby the machinery employed would permit continuous cutting, extracting and loading. There can be no true mass production as long as all these operations are not integrated and performed as one. Coal is a basic product. It is the indispensable fuel. The coal industry is progressive and already considerable work has been done in the development of an experimental continuous miner. These machines, when fully developed and adapted to various mining conditions, will make possible the cutting, dislodging and loading of coal in one operation.

Coal, like any mineral, is a wasting asset, and cost increases as we advance from the original point of entry of the seam. As an example, haulageways daily increase in length, thus the cost of landing the coal or ore on the surface also increases and eventually a point is reached where, unless new techniques are developed, it is no longer economical to mine the mineral. The same applies to ventilation and the upkeep of airways, and all the other auxiliary operations practised in getting coal. So, in order to prolong the fateful day, when we must, as we say in the coal mining industry, "put the bush in her", various schemes and improvements must be continually practised by management. Mechanization and mass production of coal will reduce cost. It will not cause unemployment, as many seem to think. It will, however, enable the Canadian mines to produce more coal and thereby supply a greater percentage of Canada's coal requirements. Many of our labour leaders seem to ignore the fact that wages come from production; if production is increased, then mechanization will tend to increase wages.

MANAGEMENT—

TODAY AND TOMORROW

by

Paul Kellogg, M.E.I.C.

President,

Stevenson & Kellogg, Ltd.,

Montreal.

PART TWO

Methods—Formal and Informal

The second in a series of three papers on Management prepared for The Engineering Journal

In Part 1 of this series, we noted several factors that contributed to the degree of formality in management procedure. One was the growth in the company's size. Another was the more acute competitive position of individual companies and, in general, the increased competitive pressure on all business. We noted, also, that the type of company cost structure often indicated that formalization was proper in some departments but not so necessary in others. In this instalment these topics are expanded, and some of the reasons given for the conclusions arrived at.

Growth as a Factor in Formality of Management

Formalization is needed when the processes of business management become sufficiently complicated so as to be beyond the comprehension of a single brain. Formalization provides what is in effect a mechanical brain into which certain facts are inserted and out of which certain results can be obtained at will, and in which there is a memory of what has been put in so that nothing need be omitted when the proper time comes to use such information. This need for formalization with growth can be simply illustrated. Take, for instance, scheduling. As long as there is a simple operation within a business a single man can schedule the operations of his department. He can keep the orders all on his desk; he can, by passing along among the machines, determine how much is done, and who is ready for more work, and the degree of completion of the orders; he can put the proper order ahead of others. In other words, he can do a fairly satisfactory job of scheduling without any paper work outside of a few memoranda.

The department manager must also requisition the proper materials and assure they are delivered on time. He must watch his stock piles and bins. At the end of a week, by a rough inventory, he can assess his needs for the following week. He can keep account of all these varied things within his own mind because of their simplicity.

As his business grows, however, more formal systems have to be introduced. The greater the volume of business, the more complicated and detailed must be this scheduling system. It is now necessary to have an entire department occupied with scheduling, co-ordinating purchases and inventories and following up of supplies closely, to avoid delays in the manufacturing process. The machine loading programme must be adroitly administered so that there be no delays, for it is unlikely that employees will be so flexible that to satisfy an immediate need, they can be shifted from one machine to the other. It is far more likely that each man has a particular place and, if there is no work, he will be idle.

Similar conditions relate to formalized employment procedure. In the small plant the boss himself interviews the people who may come to work for him. He knows what they are doing and he knows their personality. It would be more simple, in his case, to take on a few that he might have to get rid of later on because he misjudged them, than to set up a complicated and formal procedure of application, testing and induction. But, as with production, when the number of new employees increases, the complexity of jobs they are to fill becomes greater. The problem then is to have all the information possible so that there will be the least wastage of employees, the same as there would be the least wastage of material. It seems obvious, therefore, that the volume or size of operation is one factor that contributes logically to the degree of formalization necessary in management procedure.

Competition as a Factor in Formalization

There are, however, other factors that enter into the ability of a plant to survive profitably on a simple informal basis. Informal procedure invariably breeds lack of continuous operation. Time studies in such a plant would reveal a considerable waste of time because of idle machines waiting for work, waiting for tools or waiting for supplies and other delays. In some instances these inefficiencies might not be fatal if the company were making an article that was not strongly competitive and on which, therefore, the profit was sufficiently high to stand that sort of thing.

Several decades ago there was not the need for formalized procedure in many of the smaller plants. Today, however, competition in all fields is increasing, and probably will continue to increase in severity. When competition hits these plants that have been operating with a minimum of formalized control, their selling prices cannot be set as loosely as they were before. To sell at all they must reduce their prices. This means that profits go down and the first thing they know they are operating in the red. Now they must look to saving time, and to getting increased production out of equipment. Thus do formal procedures originate. Of course competitive pressure does not always stem from cost reduction. There may be the necessity of formalizing the procedure in the sales department so that it can bring in more business.

Basically, the increase in either case arises because problems get beyond the ability of one man to handle. Yet, in one respect, the reasons for it are different. In the case of increase in size, the task becomes too great for any one man, regardless of whether methods are improved. In the case of increased formalization from competition, the task becomes greater than one man can handle without formalization because of the necessity of doing a better job even within the small plant or department concerned.

Localized or Selective Formalization

By localized or selective formalization we mean formal processes of control in certain departments, for reasons peculiar to the cost structure of the business. This is a basis of formalization that perhaps is not so well recognized as it should be. It is really a refinement of the establishment of formalization to meet competitive pressure. To understand the need it is necessary to understand the basic structure of costs. In every business costs can be roughly divided into two general patterns: those which are fixed through ordinary ranges of business volume, such as taxes, depreciation, executive salaries; and those which vary directly with output, such as materials and direct labour, where direct labour is paid altogether on the basis of output.

There are other costs which combine elements of fixed and variable costs, and which may be separated into those two kinds. Then there is a fourth kind which is irregular, and which can be roughly classified into a fixed or a variable portion. The result is that costs can usually be segregated into just two classes—totally fixed and totally variable costs. In businesses of different types the proportion of costs which are fixed and variable will differ greatly. In industries with large expensive machines, where the amount of labour is not large, you will find a high fixed cost because of this expensive equipment. In other industries with a large amount of assembly work and hand labour on material, where the equipment is relatively minor in value in relation to output, you have the reverse condition, with high variable costs and low fixed costs.

Businesses with high fixed costs have certain problems and opportunities that do not exist in businesses of high variable costs. When these are recognized, they will indicate why some departments must be more closely and formally controlled in high fixed cost businesses, than they need to be in low fixed cost businesses. To explain the matter clearly, let us illustrate with two hypothetical companies. First, we have Company "A", a high fixed cost company. The operating statement for that company is as follows:

Let us explain these terms. Increment margin is the difference between the selling price and the sum of all the variable costs required to produce. This margin pays all fixed costs, and if there is any balance remaining it becomes profit. If the margin exceeds fixed costs, operations are profitable. If it is less than fixed costs, losses result. Profit-volume ratio is the ratio between the increment margin and selling price. This becomes the percentage of the selling price and therefore, the percentage of any increase or decrease in sales which is added to or subtracted from increment margin when sales change. This is an important figure to know because it thus computes the gain or loss in profits arising from changes in dollar sales. Labour-volume ratio is the ratio of direct labour costs to selling price. This ratio applied to changes in sales value indicates how much more or less should be expended for direct labour. Conversely it indicates how much new sales value of production would arise from increases in volume of labour.

Let us assume a successful effort is made to reduce direct labour cost per unit by as much as 10 per cent. This would be accomplished with labour's full co-operation, and would be the resultant of better management, leading to the elimination of idle and waiting time, and the reward to the workers for better than standard basic performance. Now the operating statement will show direct labour as $9,000 and profits as $11,000. This changes the ratios at the bottom of the statement. The increment margin is now $61,000, profit-volume ratio is 61 per cent and the labour-volume ratio 9 per cent.

Company "A"—High Fixed Costs

Operating Statement

Sales			$100,000
Variable Costs:			
Labour, Direct	$10,000		
Material	25,000		
Other	5,000		
Total		$40,000	
Fixed Costs:			
Maintenance & Depreciation	$15,000		
Factory Salaries	15,000		
Insurance & Taxes	2,000		
Sales & Admin.	13,000		
Other	5,000	50,000	90,000
Profits			$ 10,000
Increment Margin ($100,000—$40,000)			60,000
Profit-Volume Ratio (P/V) 60,000 ÷ 100,000			60%
Labour-Volume Ratio (L/V) 10,000 ÷ 100,000			10%

After this campaign, if business does not increase, the only saving is the $1,000 saving in labour cost (but not labour *rates* as explained above), which results in $1,000 or 10 per cent more profit. It may be possible to sell the increase in the volume of production, made possible by reason of the increase in labour efficiency of at least 10 per cent, for if labour costs had been reduced 10 per cent the only way that this can be realized on the present manufacturing volume is to reduce the labour force. If bonuses are paid to those remaining on the payroll this reduction would have to exceed 10 per cent. Instead of making this reduction through normal turnover or through transfer of employees to other departments an attempt is made to increase the business, so these workers can be retained for higher production. This is possible and very profitable for the company because by reason of this more efficient labour programme the actual capacity of the department has been increased. Labour is producing more per man per day.

There will be at least $1,000 worth of labour available, and if the remaining force is earning a normal minimum of 20 per cent bonus under the revised incentive programme, there would be $3,000 worth of labour available. The labour ratio under the revised conditions is 9 per cent. Therefore, if $1,000 to $3,000 worth of labour is to be used to produce more goods, the amount produced by that labour in sales value is $11,100 to $33,300. Because this business has a high profit-volume ratio, the increased increment margin on this additional sales is 61 per cent of this amount, or $6,771 to $20,313. As fixed costs have already been absorbed, this increased increment margin also represents that much additional profit.

Thus, if more business can be secured, instead of making only $1,000, which is saved in labour cost, the profits will grow to a minimum of $6,771 or possibly $20,000 by reason of the increased production now possible. This is 67 per cent to 200 per cent of the profit that existed before incentives went into effect, and nearly 7 to 20 times as much as from labour savings alone on the old volume of business. This illustrates clearly how important sales effort is in this high fixed cost company. If there is to be any formalization, it is most important that it be done in the sales department, where good results will be so apparent in increased profits.

The same type of reasoning is now applied to Company "B" which is a low fixed cost company. The operating statement for that company is as follows:

Company "B"—Low Fixed Costs

Operating Statement

Sales			$100,000
Variable Costs:			
Labour	$40,000		
Material	25,000		
Other	5,000		
Total		$70,000	
Fixed Costs:			
Maintenance & Depreciation	2,000		
Factory Salaries	8,000		
Insurance & Taxes	1,000		
Sales & Admin.	8,000		
Other	1,000		
Total		$20,000	$ 90,000
Profits			$ 10,000
Increment Margin ($100,000-$70,000)			30,000
Profit-Volume Ratio (P/V) (30,000 ÷ 100,000)			30%
Labour-Volume Ratio (L/V) (40,000 ÷ 100,000)			40%

There is a project in this company also to increase labour efficiency, resulting in a reduction of labour cost (but not of labour rates) of 10 per cent. The overall reduction of 10 per cent is possible even though individual workers earn as much as or more than before. This means $4,000 in this plant as against $1,000 in the high fixed cost company. This $4,000 saving or profit is 40 per cent of the present profit of the company, whereas the 10 per cent saving in labour cost in the Company "A" was only 10 per cent of the profits. So this company has effected an increase in percentage profits four times greater than the percentage reduction in labour cost.

The revised operating statement will now show a labour cost of $36,000 and an increase in profits to $14,000. This will change the profit-volume ratio to 34 per cent, and will reduce the labour-volume ratio to 36 per cent. Let us now assume that this company also was able to fill up the production possibilities created by the increase in labour efficiency, by the amount of business that $4,000 to $12,000 worth of labour could bring in. The new labour-volume ratio of this company is 36 per cent, therefore, $4,000 worth of labour can bring in $11,100, and $12,000 worth of labour can bring in $33,300, the same amounts, which it was found, could be brought in by the saving in labour cost in Company "A". The difference comes, however, in the amount of profit that can be earned. The profit-volume ratio even on the new basis is only 34 per cent or $3,774, and 34 per cent of $33,300 is $11,322, the profit from the business which these otherwise unneeded employees could account for. This is only approximately half the additional profits found in the case of Company "A".

It is now seen that in Company "B", the savings from the reduction in labour cost are the most important item. Very close and detailed formalization must be applied to their labour payment plan, to scheduling all items that affect direct cost, because this is such a large factor in the total cost. In Company "A" the chief reason for improved labour efficiency is the necessity for increasing the capacity of the plant to take care of new highly profitable business. The two above illustrations show clearly the need for selective formalization when the reason for it is clearly understood.

Scope of Formal Procedures

There have been many books written on plans of formal procedures. The following partial list indicates the choice that lies before management. It starts at the basic organization and goes through the various processes of manufacture and the control of material, labour and office, and ends up with some financial considerations. The list though not a complete one, does cover the main subjects usually included in formal procedures.

List of Formal Techniques and Procedures

(1) *Organization Charts*

Formal pictures of lines of authority throughout the organization.

(2) *Standard Practice Information*

A formalizing of all routine in the entire organization, or in selected departments or procedures.

(3) *Job and Salary Descriptions*

(4) *Job and Salary Evaluations*

Descriptions and evaluations are valuable to the employment department in filling each job. They are good for mutual understanding of the requirements and scope of the job by the employer and employee.

(5) *Employee Selection*

More or less formal techniques of interview, testing, physical examination and other procedures.

(6) *Employee Training*

This is training of employees in the technical requirements and the best method of doing their work. It is applied particularly to new employees but also used for older employees in work simplification programmes.

(7) *Employee Evaluation*

Also known sometimes as merit rating, wherein employees are evaluated on the work they do, giving due credit to those who are doing a better job than the average and finding means by which those below the average may be brought up to a higher rating.

(8) *Plant Layout*

A formal layout of machines and equipment showing the flow of work in the plant to the best advantage of the manufacturing programme.

(9) *Motion Study*

The working out of the best possible manner of doing any selected task. The more complicated the tasks, the larger the plant, the more it pays to adopt this formal procedure.

(10) *Scheduling*

Several comments have already been made on scheduling, which may be done by means of very complicated procedures down to very simple ones.

(11) *Inventory Control*

(12) *Preventative Maintenance*

This includes many features such as regular inspection to prevent breakdown, and the concentrating of most of the maintenance work in the preventative category.

(13) *Time Study and Output Standards*

Ultimate time study practice demands people who have spent months in learning it, so that a correct job can be done.

(14) *Market Research*

(15) *Sales Management*

Including quotas, incentives, training and a general drive of all salesmen to bring in business.

(16) *Sales Incentives*

(17) *Standard Costs*

A system of accounting by which actual costs are measured against pre-determined standards.

(18) *Flexible Budgets*

A plan by which each department which controls expenditure of money for men or materials is treated as if it were in business for itself. It is given standards against which to operate, which change with the volume going through the department, and is judged against the operations in terms of these flexible standards.

(19) *Financial Budgets*

(20) *Statistical Quality Control*

(21) *Keymen Incentives*

Often tied in with flexible budgets.

(22) *Executive Incentives*

Sometimes tied in with profit sharing.

(23) *Executive Training*

Attention to the training of minor and major executives in their own field.

(24) *Personnel Administration*

This again covers a multitude of practices from the organization of the Personnel Department to the more or less formalized procedure in induction, development and separation of employees.

(25) *Formalized Grievance Procedure*

(26) *Health and Safety Programmes*

(27) *Labour - Management Committees*

Often of great value in increasing production.

(28) *Suggestion Systems*

(29) *Physical Fitness Programmes*

(30) *Recreational Programmes*

(31) *Insurance and Pension Programmes and Plans*

(32) *Machine Accounting*

(33) *Office Methods and Incentives*

(34) *Other Special Reports and Investigations*

With all these things to consider, it is no wonder that there has sprung up in the last quarter century a profession variously called industrial engineering, management engineering or management consultants. This profession contains within it people attached to industry and those operating outside as consultants. These professionals spend their time in studying these various formalized procedures. Management will be well advised, when confronted with the necessity of reviewing the formalization of their procedure, to have such men on their staff, or to consult those outside, who can give counsel when considering the extension of the formalization of procedure, because otherwise mistakes can be made. Mistakes in formalization can be costly.

From Month To Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Technical Papers

Catering as it must to all kinds of engineers, the *Journal* cannot publish some of the more technical papers offered to it without drawing upon itself the wrath of those whose interests lie along other lines. As it is, we find our readers hard enough to please, a condition not to be wondered at in view of the catholic composition of Institute membership.

What we should do is to reserve technical material, especially that of lasting value, for a regular series of "transactions", thus leaving the *Journal* free to publish articles of general or transient interest only. Unfortunately, it seems unlikely that we shall be financially able to adopt this very desirable policy for a long time to come. Therefore, as a compromise between what we would like to do and what we feel we can do, it has been decided to issue Technical Papers as occasion demands.

These will include papers which we feel will be of real interest and value to members, mostly the kind of material to which those interested will refer frequently. In form, the papers will be letter size, both stapled and punched, so that they may be preserved in pamphlet form or filed in a ring binder.

Technical Papers will not be distributed automatically to all members — you will have to order them — but each will be briefly reviewed in the *Journal* when ready. Sales will be on a cash basis to avoid the nuisance of bookkeeping and to keep prices as low as practicable. Prices, by the way, will be set at a figure just high enough to cover costs of production and mailing and so will vary.

Technical Paper No. 1, now ready, is entitled "Flow in Conduits and Canals", by Professors R. DeL. French, M.E.I.C., of McGill University, and F. M. Wood, M.E.I.C., of Queen's University, and is reviewed briefly on page 292. This is the manner in which it is proposed to advise members of the publication of all future Technical Papers.

Two other Technical Papers are in preparation, one dealing with the hydraulics of air-water mixtures and the other with the design of resistors in radio engineering.

The Publication Committee solicits other papers for inclusion in this series. They may be of any length and on any subject; the essentials are that they be concise, that they contribute something to the literature of the subject and that they be of reasonably wide appeal.

M.I.T. Awards New Degree

The following announcement of the award of a new engineering degree by Massachusetts Institute of Technology has been supplied to the Journal by M.I.T.'s News Service. Ed.

A new terminal for practicing engineers, to be called the "Engineer" degree, has been approved at the Massachusetts Institute of Technology and is expected to be awarded for the first time at the Institute's commencement this June, Dr. John W. M. Bunker, dean of the Institute's Graduate School, announced recently.

The degree "Engineer", with the field of specialization designated, will require about two years' study following a bachelor's degree in any one of the Institute's various engineering departments.

"The new degree," said Dean Bunker in making the announcement, "fills an educational need for the development of professional engineering competence at a higher level than is ordinarily represented by the Master of Science degree."

"The expansion of scientific knowledge which can be applied in several areas of engineering practice has been so extensive," Dean Bunker pointed out, "that a specialist in any one field needs to achieve more than casual acquaintance with related fields if he is to render the most effective service in engineering."

"With the establishment of the Engineer degree as a terminal degree for those who will practice engineering," Dean Bunker concluded, "the Ph.D. and Sc.D. degrees will continue to be the objective for those who have interest in and aptitude for original, creative research."

The new degree will be recommended for students who complete an individually-planned, two-year programme of study and research at the Institute beyond their undergraduate degrees. Emphasis will be placed upon engineering practice rather than on the research which is characteristic of a programme of study leading to a Ph.D. degree.

Most Master's Degree candidates at the Institute require slightly more than one year of study to complete their work; candidates for the new degree, Engineer, will require at least two years at the Institute. This added time will result in more thorough training in a wider variety of relevant subjects, and also will enable students to delve more extensively into such fields as industrial economics, business administration, labour relations and international affairs, thus improving their understanding of the social implications of the work in which they will be engaged.

When the field of specialization is to be indicated, the Engineer degree will be referred to as follows: Civil Engineer, Mechanical Engineer, Metallurgical Engineer, Electrical Engineer, Chemical Engineer, Sanitary Engineer, Marine Mechanical Engineer, Naval Architect, Naval Engineer, Aeronautical Engineer, Building Engineer, and Meteorologist.

LOYALTY TEST

By Harvey N. Davis

President, Stevens Institute of Technology

> *"Unless you can find some sort of loyalty, you cannot find unity and peace in your active living."*
>
> —JOSIAH ROYCE

NOWADAYS, when an FBI man asks me about the loyalty of so-and-so, I reply that, as far as I know, he is not, and has never been, and, in my opinion, is not likely to become, either a traitor, a spy, or a Communist of the Russian brand trying to bore from within. That seems to cover the question.

But surely, this adds up to a very narrow definition of the fine old word "loyalty"; and maybe this is a good time for us to re-discover the broader meaning which Professor Royce had in mind, 40 years ago, when he wrote the lines quoted above.

True loyalty, according to Royce's definition, is never a negative thing. It is a positive, wholehearted and outflowing devotion to something beyond your private self, bigger than you are.

In the long run, he believed, no one can be secure or successful or happy if he lives only for himself. We grow only by giving the best of ourselves to something that we believe in heart and soul. This is the essence of loyalty.

In terms of this definition, how loyal are you? Here is a simple way to find out. Below are some things in which nearly everyone believes:

1. **Your family**
2. **The organization for which you work**
3. **Your community**
4. **Your church**
5. **Your country**

Now put this list aside. Then take it out again a few days or weeks or months from now. When you do, ask yourself this question: "Since first reading this page, have I so lived that these five things are stronger, better, finer because of me?"

If you can answer a truthful yes, then you will know that you understand the meaning of loyalty—and, along with it, the secret of true happiness.

Reprinted from THIS WEEK *Magazine*

Reviews of Technical Papers

No. 1. "FLOW IN CONDUITS AND CANALS", R. DeL. French, McGill University, and F. M. Wood, Queen's University.

This paper provides working tables and diagrams for the solution of many hydraulic problems concerning flow in open or closed channels not under pressure. The text is given over almost entirely to illustrative problems. The tables give values of logarithms of 1.318 C, $r^{0.63}$ and $s^{0.54}$ in the Hazen and Williams' formula, and of recommended values of C.

There are nomograms for the solution of this formula for circular sections, for correlating C in this formula with n in the Kutter formula, for solving Markmann's formula for loss of head on curves and for reducing canal sections to equivalent circular sections. Other graphs give the values of the hydraulic elements, Q and V, of a variety of sections which it is believed will cover all ordinary cases Another chart gives the diameters of circular sections equivalent to the sections just referred to.

Many of these tables and diagrams were developed by the authors for use in their private practice, the others were specially computed to complete the treatment of the subject. They will be useful in shortening and facilitating computations required in hydraulic designs of many kinds.

The price of this paper is $1.50 cash with order, which may be sent to Institute headquarters, 2050 Mansfield St., Montreal 2.

Correspondence

Toronto, April 13, 1949.

To the Editor,

While specific provisions for dealing with situations such as those mentioned in the letter of G. A. Leonards, M.E.I.C., (*Eng. Journal*, Nov. 1948), may be lacking in the ECPD Canons of Ethics for Engineers, these and similar difficulties may often be resolved by application of the general principles set out in the two introductory paragraphs.

When an engineer is requested to write a recommendation for a former employee or student whose qualifications are inadequate for a desired position, he has no alternative to telling the truth. He is under an overriding duty of service to the public and to those who employ engineers. The second paragraph of the preamble of the ECPD Canons of Ethics requires him to discharge his duties "with fidelity to the public, his employers and clients, and with fairness and impartiality to all." Solicitude for the future of another engineer should not lead him into the position of justifying incompetency at any time. Failure to disclose the inability of an applicant to discharge the duties of a post satisfactorily might react very unfavourably on the profession as a whole.

In justification of a consulting engineer charging the full fee for plans that are very similar to those used for another work it may be said that what the client pays for is expert knowledge and skill. The furnishing of that knowledge and skill through the use in large measure of plans that have been previously used by him would seem to be not different from the charging by a surgeon of a standard fee for performing a common and highly conventionalized operation which he has performed scores or maybe hundreds of times before. Moreover, the reduction of the fee below the standard that must be charged by a less-experienced competitor might be held by the Association of Professional Engineers of the Province as constituting unfair competition.

C. R. Young, M.E.I.C.

Dean,
Faculty of Applied Science,
University of Toronto.

April 14, 1949

Mr. L. A. Wright,

General Secretary,
The Engineering Institute of Canada.

Today, after a long hard struggle, the Ottawa headquarters of "March of Books" are officially being transferred to the Canadian Book Centre in Halifax. However, it is most gratifying to know that when the campaign is completely over we will have collected a little over 200,000 books and periodicals.

May I take this opportunity of expressing the deep appreciation of the officers of "March of Books" for the magnificent support given to us by the Engineering Institute of Canada. Miss Royal-Gagnon joins me in extending our personal thanks for your warm words of counsel and encouragement when we were in difficulties.

W. A. Magill,
Director, March of Books

Monopoly and Wages

The Editor,

Further to Mr. J. L. Wickwire's and the Engineering Institute's comments on low salaries in the engineering profession (Feb. issue of the *Journal*) — with which I heartily agree, I would like to point out that the engineer has not yet a monopoly of his profession, which all successful professions have, in varying degrees. Without creating a monopoly, price of labour or other commodities, cannot be controlled. The engineer has long been too busy protecting his reputation so that the employer can be sure he gets competent advice, and not sufficiently busy at seeing that the employer pays for it. Try and get technical advice from a physician, chartered accountant, or lawyer free, that you could easily extract from an engineer.

Monopolies, whether of capital or labour are natural phenomena of the free enterprise system. The word "monopoly" is used in its full economic sense and, till engineering becomes a monopoly it will remain a poorer profession. Premier Duplessis of Quebec recently contended that engineering as the

Headquarters Records

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Product or Service ....

Position or Title ....

Degree, Year & College ....

Advise Headquarters Promptly of Changes engineers would have defined is " no monopoly ", and he is perfectly right. Too small a group is trying to control too large a field of technical jurisdiction. Primarily, the field and jurisdiction of engineering has yet to be defined in a practical way, when this is done all employed in doing engineering work within the field — whether they be specialists in diverse fields such as physicists, chemists and even practical designers, etc. — must be induced to join an organization that is willing to, and can talk price. This organization could have sufficient grades within it to appease those that have superior backgrounds. A poor and unfair way to create a monopoly is to exclude those that are doing the actual technical work with the arbitrary statement "they are not qualified " I am sure that all competent men, whether they be university trained or of a lower order, would be willing to join together to arbitrate adequate wages for all, not just the few.

United effect, such as raising wages, can only be had by united effort. Insofar as the word " union " seems to be odious to our profession, let us call it an association as the physicians have done. Let it not be a closed union as well as a closed shop concept, this, as I believe most students of economics will agree, can only have poor results to both the profession and employer.

H. Verdier, s.e.i.c.

News of Other Societies

The **Canadian Electrical Association's** 59th Annual Convention will be held at the Banff Springs Hotel, Alberta, on June 28, 29, and 30, 1949.

B. C. Fairchild, managing director of C.E.A., is in charge of arrangements. His office is at Room 704 Tramways Building, Montreal 1, Que.

The Montreal regional conference of the **American Institute of Chemical Engineers,** September 7, 8 and 9, 1949, will devote two days to technical papers. Plant visits to several industries at Shawinigan Falls, Que., have also been arranged.

Members of the Engineering Institute are invited to attend, and the local committee on arrangements includes several E.I.C. members. Its chairman is Dr. H. R. L. Streight, P.O. Box 10, Montreal.

The **Chemical Institute of Canada** reminds engineers of the annual chemical conference in Halifax, May 30 to June 1, 1949 at the Nova Scotian Hotel. C.I.C. head office is at 18 Rideau St., Ottawa.

A cordial invitation from the **American Society for Engineering Education** is extended to all those interested in Engineering Education to attend the 57th Annual Meeting (June 20 to June 24) to be held at Rensselaer Polytechnique Institute located at Troy, New York.

The programme at this meeting will consist of four general sessions to hear and to discuss papers of general interest together with some sixty functional conferences to discuss a variety of educational problems in such fields as, research mathematics, mechanics, architectural engineering, drawing, mineral engineering, industrial engineering, chemical engineering, electrical engineering, aeronautical engineering, physics, etc.

Reservations for registration, quarters and meals may be made by writing to Professor A. Allan K. Booth, Department of Mechanics, Rensselaer Polytechnique Institute, Troy, New York.

The Society of the Plastics Industry, 295 Madison Avenue, New York 17, N.Y., announces its 1949 annual meeting for May 26 and 27 at Edgewater Beach Hotel, Chicago, Ill.

Further programme notes are now available from the Society.

The **American Water Works Association,** 500 Fifth Avenue, New York, 18, N.Y., will welcome enquiries about its 69th Annual Conference, May 30 to June 3, 1949, at the Stevens Hotel in Chicago, Ill.

The summer national meeting for 1949, **Society of Automotive Engineers,** will convene June 5 to 10, at French Lick Springs Hotel, French Lick, Indiana.

Inquiries should be addressed to S.A.E., at 29 West 39th St., New York 18, N.Y.

The schedule of 1949 meetings of the **American Institute of Electrical Engineers** includes: the summer general meeting at the New Ocean House, Swampscott, Mass., June 20-34; the Pacific general meeting at the Fairmount Hotel, San Francisco, Cal., August 23-26; the midwest general meeting, at Netherland Plaza Hotel, Cincinnati, Ohio, October 17-21.

A.I.E.E. headquarters are at 33 West Twenty-ninth St., New York, N.Y.

The summer convention of the **American Society of Civil Engineers** is taking place this year in Mexico City, July 13-15.

Information can be obtained from the Society, 33 West Thirty-ninth Street, New York 18, N.Y.

The 52nd Annual Meeting of the **American Society for Testing Materials** will take place June 27 to July 1, 1949, at Hotel Chalfonte-Haddon Hall, Atlantic City, N.J.

Information can be obtained from the Society, 1916 Race St., Philadelphia, 3, Pa.

The **American Society of Mechanical Engineers,** 29 West 39th St., New York 18, N.Y., will hold its 1949 Semi-Annual Meeting at San Francisco, Calif., June 27-30.

The Engineering and Marine Exhibition, at Olympia, London, England, planned for August 25 to September 10, 1949, is to incorporate a Welding Exhibition.

The exhibition is supported by the British Engineers Association (Incorporated); the Society of Motor Manufacturers and Traders Ltd., The British Electrical and Allied Manufacturers' Association (Incorporated); The Institute of Welding; and The British Acetylene Association. The organizers are F. W. Bridges & Sons, Ltd., Grant Building, Trafalgar Square, London, W.C. 2.

The National Congress of French Engineers will take place on June 4, 5, and 6, 1949 at Toulouse.

The congress is organized, under the aegis of the Federation of French Engineering Societies and Associations, by the **Union of Engineers of the Toulouse Region.** The office of the latter is at 8, rue du Poids-de-l'Huile, Toulouse, France.

Personals

Notes of the Personal Activities of Members of the Institute

Fred Seibert, M.E.I.C., of Winnipeg, Man., was installed as president of the Canadian Institute of Mining and Metallurgy at the recent annual meeting of that Institute in Montreal.

Mr. Seibert is industrial commissioner for Canadian National Railways in Winnipeg, Man.

P. L. Pratley, M.E.I.C., Montreal consulting engineer, was recently placed in charge of building the $13,500,000 bridge to gap the Strait of Canso, between Cape Breton Island and the Nova Scotia mainland. Mr. Pratley, whose appointment was announced recently by the Dominion Transport minister, was a member of the joint Dominion-Nova Scotia board of engineers which has been surveying the bridging project for more than a year. The bridge is expected to be completed by about 1953.

T. G. Tyrer, M.E.I.C., chief surveyor of the surveys branch of the land titles office, has retired after thirty years of service with the Saskatchewan provincial government.

Mr. Tyrer came from England to Saskatoon in 1911, and was articled to W. M. Stewart of Phillips, Stewart and Lee, civil engineers and land surveyors. He went overseas in World War I with the Canadian Army, mustering out in 1919 with the rank of lieutenant-colonel. On his return he rejoined Phillips, Stewart and Lee.

In 1921 he joined the staff of the surveys branch in Regina, and qualified as a Saskatchewan land surveyor in 1923. He became deputy chief surveyor in 1931, and in 1944 he was appointed chief surveyor.

On going to Regina, Mr. Tyrer joined the 14th Field Company Engineers, commanding the unit until 1933, when he took over command of the 12th district engineers. He was posted to the corps reserve in 1938 and went overseas in 1940 in command of the Engineer Company No. 1 General Holding Unit. He returned from overseas and was posted to the corps reserve in 1941.

He is a past president of the Saskatchewan Land Surveyors Association, and at present is secretary of the organization.

Sir G. D. Rhodes, M.E.I.C., who is in Nairobi, Kenya Colony, British East Africa, has terminated his services with Sir Alexander Gibb & Partners, on completion of the work for which he was sent to Kenya. He has taken an appointment under the Government of Kenya, as special commissioner for works and chief engineer.

F. L. Leduc, M.E.I.C., Montreal consulting engineer, has been appointed vice-chairman of the Tariff Board of Canada.

Mr. Leduc graduated from Ecole Polytechnique, Montreal, and later received a degree of Master of Arts in social sciences and political economy from University of Montreal. A former Montreal alderman, he was a member of the Quebec Legislative Assembly from 1935 to 1946 and was provincial minister of highways from 1936 to 1938.

A. G. Graham, M.E.I.C., director of the Regional Planning Division, Department of Municipal Affairs, British Columbia Government, resigned recently and took up duties on April 1st as division engineer on the construction of the Pacific Great Eastern Railway between Quesnel and Prince George, B.C.

J. A. Lalonde, M.E.I.C.

J. A. Lalonde, M.E.I.C., Montreal consulting engineer, has been elected president of the Corporation of Professional Engineers of Quebec for the year 1949. Mr. Lalonde is a past-councillor and past-treasurer of the Institute, and a past-chairman of the Montreal Branch.

J. A. H. Henderson, M.E.I.C., of Montreal, is vice-president of the Corporation; and **F. S. Howes,** of Montreal, is the secretary-treasurer. Councillors of the Corporation are: **L. W. Bladon,** Montreal; **Leo Dufresne,** Quebec; **G. Letendre,** Quebec; **L. O'Sullivan,** Montreal; and **A. Pouliot,** Quebec.

Professors Raymond Boucher, M.E.I.C., **Léonard Cartier,** M.E.I.C., and **André Leclerc,** M.E.I.C., of the department of hydraulic engineering at Ecole Polytechnique, entered recently into partnership for private practice under the name, Boucher, Cartier, Leclerc, consulting hydraulic engineers. Their firm specializes in the field of hydraulic engineering, such as the design and supervision of projects related to water supply and water distribution, sewage, hydro-electric developments, river regulation, canals, hydraulic models studies, testing of hydraulic machinery, studies in hydrology and related subjects.

Professor Boucher is a graduate of Ecole Polytechnique, class of 1933, and a master of science in civil engineering (M.I.T. 1934). He has been connected, since graduation, with Ecole Polytechnique and has many times served as consultant for various power companies. He is presently professor and head of the department of hydraulic engineering at Ecole Polytechnique.

Messrs. Cartier and Leclerc are, respectively, associate and assistant professor in the same department and have been, since their graduation, connected in various ways with projects in the field of hydraulic engineering.

R. M. Hardy, M.E.I.C.

R. M. Hardy, M.E.I.C., dean of the Faculty of Engineering of University of Alberta, Edmonton, has been elected president of the Association of Professional Engineers of Alberta for the year 1949.

F. A. Brownie, M.E.I.C., of Calgary, has been elected vice-president of the Association.

Councillors of the Association are: **J. G. Dale,** M.E.I.C., Edmonton; **John Haddin,** M.E.I.C., **H. B. LeBourveau,** M.E.I.C., and **J. G. Spratt,** M.E.I.C., of Calgary; and **D. B. Menzies,** M.E.I.C., **John G.**

Dale, M.E.I.C., and **L. A. Thorssen,** M.E.I.C., of Edmonton; and **W. L. Foss,** M.E.I.C., of Lethbridge. **Julian Garrett,** M.E.I.C., is Dominion Councillor; and **P. M. Sauder,** M.E.I.C., is councillor representing the Engineering Institute. University faculty representative is **R. S. Trowsdale,** M.E.I.C.

Mark M. Winred, M.E.I.C., has established a consulting engineering practice in Montreal, for the planning and preparation of estimates in connection with new enterprises, and reorganization and adaptation of existing ones.

He has been in manufacturing industries since his graduation in 1921 from the University of Warsaw, Poland, with the degree of master of science. He was with Warsaw Locomotive Works until 1934. In 1925 he had been made superintendent of the diesel engine department.

M. M. Winred, M.E.I.C.

Mr. Winred came to the United States in 1936 as a delegate to the Third World Power Conference in Washington; and after further work in Europe, came to Canada in 1941 under an agreement between British, Canadian, and Polish Governments. He has been associated since that time, with Canadian firms, advising on the manufacture of such materials as diesel and gasoline engines; ships, shells and guns; valves; prefabricated dwellings and plywood aeroplane parts; and pulp and paper making equipment.

C. D. Schultz, M.E.I.C., of C. D. Schultz & Company Limited, foresters and forest engineers, Vancouver, returned in March from a three-week trip to British Guiana, where he had gone in order to advise on a timber development and management problem for a British Crown Corporation.

Mr. Schultz had made trips in a similar capacity to Australia and New Guinea last Spring.

Karel R. Rybka, M.E.I.C., Toronto consulting engineer, has been elected a director of the Eric Dent Company Ltd., Toronto. This recently formed company has started pilot operations on dehydration of legume crops, and Mr. Rybka has been entrusted with their engineering problems.

Donald Mordell, M.E.I.C., associate professor of mechanical engineering at McGill University has received a graut for research in gas dynamics. His laboratory is at Macdonald College, in Ste. Anne de Bellevue, Que., and houses a new turbo-jet engine a gift of Rolls-Royce Limited.

Mr. Mordell will study fuel combustion, on which he has worked since coming to McGill in 1947 following work on jet engine development at the Rolls Royce plant in Derby, England.

His research is supported by the National Research Council and the Defense Research Board. The first contributions were received by McGill from Imperial Oil Limited and Ford Motor Company of Canada, for the opening of Canada's first gas dynamics laboratory.

W. T. Holgate, M.E.I.C., has been appointed, recently, to the application engineering division of the Canadian General Electric Company's Apparatus Department. He will be responsible for commercial engineering studies involving medium industry and modernization projects.

Mr. Holgate graduated from the University of Alberta in 1930 and since that time has been associated with the Company's test department, with general engineering, the instrument laboratory, the production department, and with the Toronto district office as sales engineer. Recently he was manager of the general sales section, at the Toronto district office.

Geddes M. Webster, M.E.I.C., was recently appointed assistant inspector of mines for Northwest Territories by the Dominion Department of Mines and Resources. He is stationed at Yellowknife.

Mr. Webster has been a consulting engineer in the Yellowknife district for the last three years, and previously he was with the engineering and production departments of Defence Industries Limited, at Verdun, Que., and Canadian Industries Limited, Nylon Division, at Kingston, Ont.

D. L. MacKinnon, M.E.I.C., is managing director of the Bayside Construction Company Limited, Campbellton, N.B., a newly formed company which has taken over the construction operations of the J. & D. A. Harquail Company Limited, and which will carry on a general contracting business.

D. L. MacKinnon, M.E.I.C.

Mr. MacKinnon graduated from the University of New Brunswick in 1939 with a B.Sc. degree in civil engineering and in 1944 received his M.Sc. degree from the same university. After graduating, he joined the Foundation Company of Canada as an engineer. During the years 1940 to 1943 he was associated with the Arvida construction and the Shipshaw Hydro project, and for a period was chief engineer with Foundation Company's subsidiary, Gunite and Waterproofing Company. In 1943 he enlisted with the R.C.A.F. and received his pilot's wings. In 1945 he returned to the Company and worked on various projects. He has been in Campbellton for some time.

Fred Hunt, M.E.I.C., has been appointed assistant division engineer for Canadian National Railways at Belleville, Ont. He was previously at St. Catharines, Ont., assistant engineer on the Niagara, St. Catherines and Toronto Railway.

J. S. K. Gosiewski, M.E.I.C., has been employed by H. W. Lea, M.E.I.C., consulting engineer, as head of the Ottawa Office. He was previously with the Aluminum Company of Canada Limited in Montreal, and was a partner in the firm Korward Wood Products Company, Montreal.

P. M. de Chazal, M.E.I.C., has been appointed assistant manager of the Stanley Tool Company of Canada Ltd., of Roxton Pond, Que. He is assuming this post in addition to his former duties as methods engineer. He joined the company in 1948 after a three year period in South America as chief engineer in a cement plant located near Sao Paulo, Brazil.

R. W. Franklin, M.E.I.C., is now in Kansas City, Mo., where he is a structural plan examiner for the Department of Public Works of the City. He had previously been, from 1946, with J. Gordon Turnbull, Inc., consulting engineers, of Cleveland, Ohio.

L. A. Petrie, M.E.I.C., has joined H. G. Acres and Company, Niagara Falls, Ont. He was previously with Montreal Cottons Limited, Valleyfield, Que.

S. F. Sznajder, M.E.I.C., who was with C. D. Howe Company Ltd., Hamilton, Ont., is now with Canadian-Brazilian Services Ltd., in the hydraulic division, in Toronto.

R. H. Smith, Jr.E.I.C., has joined Burndy Canada Limited, in Toronto, Ont. He was with Canada Cement Company in Montreal since his graduation in 1947 from University of Manitoba.

Charles H. Clay, Jr.E.I.C., has been appointed division engineer, Dominion Department of Fisheries, with headquarters at Vancouver, B.C. He worked for the International Pacific Salmon Fisheries Commission for five years as design engineer and resident engineer. He has had extensive experience in the development of Hells Gate fishways and other projects on the Fraser River and its tributaries.

Mr. Clay will be in charge of a stream improvement programme on the West Coast.

William H. Hamer, S.E.I.C., is now a design engineer with the Sangamo Company in Toronto, Ont. He graduated in 1948 from the University of Toronto, with a B.Sc. degree in electrical engineering.

A. M. Thomson, S.E.I.C., is with Canadian-Brazilian Services, Toronto. He graduated from the University of Saskatchewan in 1948.

I. Attas, S.E.I.C., on graduating from McGill University this month will join the Electric Tamper Company of Canada Limited, Montreal.

G. R. Daemen, S.E.I.C., will work for the Thomson Electrical Works Limited in Montreal, after graduating this month from McGill University, Montreal.

John O. McCutcheon, S.E.I.C., who graduates from McGill University, Montreal, this month will work for the Defence Research Board, at Ottawa, Ont., in the Scientific and Intelligence Branch.

M. E. Halladay, S.E.I.C., is with the British American Oil Co. Ltd., at Montreal East, Que. He graduated in 1948 from Queen's University, Kingston, Ont., in mechanical engineering, and has since taken a training course with International Harvester Company in Hamilton, Ont.

W. H. Carr, S.E.I.C., has joined the staff of the University of Toronto. A veteran student at that University, Mr. Carr will graduate early in 1949.

W. T. Clarke, S.E.I.C., joins Westeel Products, in Montreal, on graduating in May, 1949, from McGill University. Mr. Clarke was in the R.C.A.F. from 1943 to 1945.

A. G. Morris, S.E.I.C., joins the staff of E. F. Drew and Company, Montreal, on graduation in May, 1949, from McGill University, Montreal.

Vernon D. Shute, S.E.I.C., is now a junior engineer with the Hydro-Electric Power Commission of Ontario, with headquarters at Niagara Falls, Ont. Mr. Shute graduated in 1948 from Nova Scotia Technical College, Halifax.

Visitors To Headquarters

Everett S. Lee, of Schenectady, N.Y., March 16.

Col. H. W. Love, M.E.I.C., Ottawa, and **Lt. Col. R. J. Carson,** M.E.I.C., Ottawa, on March 17.

C. M. Smyth, M.E.I.C., of Sydney, N.S., March 28.

J. D. McLeod, M.E.I.C., Vancouver, B.C.; **J. W. S. Bondy,** of Winnipeg, Man.; and **J. L. McDougall,** M.E.I.C., Riverbend, Que., on April 9.

W. R. Bonnycastle, M.E.I.C., of Vancouver, B.C., April 20.

S. Logan Kerr, M.E.I.C., Philadelphia, Pa., April 21.

Caetano Alvares, Jr., Sao Paulo, Brazil, April 23.

Edward H. Robie, New York, April 27.

E. C. Adams, M.E.I.C., Toronto, April 28.

Eugene Vinet, M.E.I.C., Caracas, Venezuela, April 30.

Institute Prize Winners

R. W. Diamond, M.E.I.C., vice-president and general manager, Consolidated Mining and Smelting Co. of Canada Ltd., Trail, B.C., has been awarded the Julian C. Smith Medal of the Institute for the year 1948. The citation which accompanies the award is as follows:

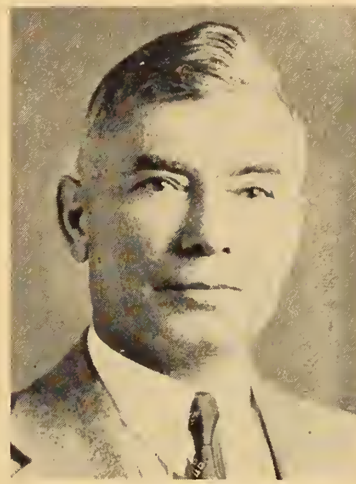
"The Julian C. Smith Medal is awarded annually, by the Institute for 'Achievement in the Development of Canada'. This year it is awarded to Randolphe William Diamond, Vice-President and General Manager, The Consolidated Mining & Smelting Co. of Canada, Ltd.

"Mr. Diamond was born in Campbellford, Ont., and graduated from the University of Toronto in 1913. He then joined the research class of the Anaconda Copper Mining Co. at Anaconda. He is one of the pioneers in the concentration of ores by the flotation process. Because of his success in this field, he was employed by the Consolidated Mining & Smelting Co. in 1917, and successfully developed a process for the concentration of the ores of the great Sullivan Lead, Zinc, Silver Mine in British Columbia, thus providing the basis for the growth of one of Canada's most important industrial units.

R. W. Diamond, M.E.I.C.

"After serving the company for a number of years as head of the concentration department, he was placed in charge of the fertilizer production programme in 1939, and has been largely responsible for the development of this important phase of industry and agriculture. The plant now produces over 500,000 tons per year. Mr. Diamond became the operating head of his company in 1935, and in 1947 he was appointed president of the West Kootenay Power & Light Co.

"Despite the pressure of company



T. H. Hogg, M.E.I.C.

duties, Mr. Diamond has found time to give freely of his services to the Institute and to the Canadian Institute of Mining & Metallurgy of which he is the immediate past president. In 1933 he was awarded the McCharles award and gold medal by the University of Toronto and in 1936 he was the winner of the Leonard Medal which is awarded by this Institute. Last year Mr. Diamond won the Blaylock Medal of the Canadian Institute of Mining & Metallurgy and he was honoured by Queen's University by the conferring of the degree of Doctor of Laws."

T. H. Hogg, M.E.I.C., Toronto consulting engineer, has been awarded the Sir John Kennedy Medal of the Institute for the year 1948. The citation which accompanies the award is as follows:

"Thomas Henry Hogg was born close to the site where he was to build for himself a record as a great engineer and a great citizen. Chippawa and the Niagara Falls area were the locale for many important events of his life from his birth to his greatest engineering achievement.

"From 1913 until 1947 Dr. Hogg served with the Hydro Electric Power Commission of Ontario, starting as a modest assistant engineer and finishing as Chairman and Chief Engineer. In addition he has rendered consulting services to public and private bodies in almost every province of Canada.

"He has served his fellow graduates and undergraduates too, as a member of the Senate of the University of Toronto for over twenty-five years. He further served the profession as president of the Engineering Institute in 1940.

"Dr. Hogg is one of those men who in spite of great professional attainments, lives close to his friends and associates. Although for years he has held great administrative responsibilities, he has not lost his deep knowledge of the technical side of his profession. He will always be an outstanding hydraulic engineer.

"The Sir John Kennedy Medal is awarded for outstanding merit in the profession — for noteworthy contribution to the science of engineering and to the Institute. Surely there is no more worthy one among us than Thomas Henry Hogg."

A. H. Wilson Busby, M.E.I.C., has been awarded the Gzowski Medal of the Institute for his paper "Localized Overheating in the Wall of a High Pressure Vessel and Its Effect on Rupture Strength", which appeared in the July 1948 issue of *The Engineering Journal.*

Mr. Busby is superintendent of engi-

A. H. W. Busby, M.E.I.C.

neering research and development for Consolidated Mining & Smelting Company of Canada Limited at Trail, B.C.

He graduated in mining engineering from University of Birmingham, England, in 1923. He had completed an apprenticeship with General Electric Company at Birmingham, in 1918, and had served in 1918 and 1919 with the Royal Air Force before entering University.

He was an electrical research engineer with the Mines Department in England for a time before coming to Canada in 1924 and joining the electrical department of Consolidated Mining & Smelting. He was assistant superintendent of the electrolytic department of the company's zinc plant from 1927 to 1930. He was made senior research assistant in the Research Department in 1930; and senior research engineer and supervisor of the instrument and physical testing division in 1945. He was named superintendent of physical research in 1945 and in 1946 he was appointed to his present position.

Mr. Busby is a member of the Association of Professional Engineers of British Columbia; of the National Association of Corrosion Engineers, the Instrument Society of America, and the Society of Experimental Stress Analysis. He is chairman of the Kootenay Branch of the Engineering Institute this year.

Others of Mr. Busby's papers have been published. A paper on "Single Core Armoured Cables for Alternating Current" written with Mr. G. M. Harvey, M.Sc., appeared in the *Proceedings of the Institution of Electrical Engineers,* in 1925. Mr. Busby collaborated with Mr. F. E. Lee on the paper "The Rapid Determination of Current Efficiency in the Electrolysis of Zinc Sulphate Electrolyte" which appeared in the *Transactions of the Electrochemical Society,* Vol. LX, 1931.

P. T. Bloomer, M.C.I.M., of Kimberley, B.C., was presented with the Leonard Medal at the annual banquet on April 26 of the Canadian Institute of Mining and Metallurgy. Mr. Bloomer's qualifying paper which was published in the *Canadian Mining and Metallurgical Bulletin.* January 1948, dealt with "Pillar Extraction at the Sullivan Mine".

Mr. Bloomer is assistant mine superintendent for Consolidated Mining & Smelting Company of Canada Limited, at the Sullivan Mine, Kimberley, B.C. A native of Kamloops, B.C., Mr. Bloomer was educated in that province before going overseas with the Western Universities Batt. in 1916. He studied engineering at the Canadian Army Military College near Godalming, England, and then went to Siberia with the Canadian Army, returning in 1919.

After one more year of study, Mr. Bloomer joined the Consolidated Mining & Smelting Company in 1920, at Rossland, B.C. He went to the engineering staff after two years underground experience. In 1925 he was promoted

P. T. Bloomer, M.C.I.M.

to the position of chief surveyor, Rossland and Outside Properties, and, two years later, to that of assistant superintendent of the Coast Copper Company, Vancouver Island.

Mr. Bloomer was assistant superintendent and engineer for the Slate and Manson Creek placers in northern B.C. from 1932 to 1934, when he transferred to the engineering staff of the Sullivan Mine. He was appointed superintendent of the Box Mine at Goldfields, Sask., in 1935, and he transferred to the Pinchi Lake Mercury Property in 1942 as superintendent. He went to his present position at Sullivan Mine in 1944.

C. O. P. Klotz, M.E.I.C., of Aluminum Company of Canada Limited, Montreal,

C. O. P. Klotz, M.E.I.C.

has been awarded the Plummer Medal of the Institute for his paper "Laurentien Aluminum," which appeared in the February 1948 issue of *The Engineering Journal.*

Mr. Klotz is from Lanark, Ontario, a civil engineering graduate of Queen's University, class of 1933. He did general contracting work until 1935, when he joined the Geological Survey of Canada to do office and field work. From 1936 to 1938 he was on the engineering staff at Kingston Penitentiary employed by the Department of Justice.

He was then for a year a lecturer in civil engineering at Queen's University. In 1939 he did soil surveys for the Ontario Department of Highways, and

J. D. A. Mollard, M.E.I.C.

that year he joined the Codes and Specifications Section of National Research Council, working on the National Building Code.

In 1941 Mr. Klotz accepted a bursary for post graduate study at Cornell University, in highway engineering, municipal and regional planning. The next year he joined Aluminum Company of

B. G. Ballard, M.E.I.C.

Canada, Limited, and until 1946 was connected with the property department in the development of the City of Arvida, except for a period of eighteen months as resident engineer in charge of construction at the Kingston Works. In 1946 he transferred to Montreal to the sales development division.

Mr. Klotz is a member of the Corporation of Professional Engineers of Quebec; of the Canadian Construction Association and the Montreal Builders Exchange. He is chairman of the Arvida Planning Committee.

J. D. A. Mollard, M.E.I.C., of Regina, Sask., has been awarded the Keefer Medal for his paper "The Engineering Significance and Photo-interpretation of Some Transported Soil Materials".

Born at Watrous, Saskatchewan, Mr. Mollard received his early education there, winning the Governor-General's Medal on matriculation. He later attended the University of Saskatchewan, graduating in 1945 with a B.Sc. degree in civil engineering. Following graduation he was employed for a season as resident engineer with the Saskatchewan Department of Highways. Mr. Mollard then moved to Indiana where he obtained his master of science degree in 1947 from Purdue University, specializing in the field of highway engineering. Subsequently for some time he was with the Indiana State Department of Highways doing research work on airphoto mapping and engineering evaluation of soil and bedrock materials. He is presently engaged as air surveys engineer with the Irrigation and Water Development Branch of the P.F.R.A., located in Regina, Saskatchewan.

A. G. Fletcher, S.E.I.C.

Mr. Mollard is the author of a number of technical papers, published in the United States and Canada, dealing with the use of aerial photography in engineering and its allied sciences. The most recent of these is entitled "Aerial Photographs Reveal Friends on the Earth's Surface," published in a recent edition of *The Saskatchewan Engineer*. In 1947 he became a member of the Institute and the Association of Professional Engineers of Saskatchewan.

B. G. Ballard, M.E.I.C., of Ottawa, is the recipient of the Institute's Ross Medal for the year 1948, for his paper "Recent Canadian Radar," which appeared in the July 1948 issue of *The Engineering Journal*.

Mr. Ballard graduated in electrical engineering from Queen's University following which he took the graduate engineering course in the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pa. On completion of this he entered the engineering department of that company and remained there until 1930. He then joined the staff of the National Research Council, assuming charge of the Electrical Engi-

K. R. Stehling, S.E.I.C.

neering Laboratory. In 1948 he became director of the Division of Radio and Electrical Engineering.

A. G. Fletcher, S.E.I.C., has been awarded the H. N. Ruttan Prize for 1948, for his paper "Draughting a Logging Topographic Map".

Mr. Fletcher was born in 1925 at Gibsons Landing, B.C. He attended various country, public and high schools on the B.C. Lower Mainland, and graduated from Lord Byng High School, Vancouver, B.C. He attended University of British Columbia graduating in civil engineering in 1948. He worked on logging topographical maps and logging engineering surveys during the summers from 1942 until 1945. During the summer of 1946, he was on topographic field parties on large mapping projects carried out by C. D. Schultz and Co. Ltd., forest engineers. During the summer of 1947, he was chief of a topographic survey party for C. D. Schultz & Co. Ltd. on a mapping project at Vancouver Bay, Jervis Inlet, B.C. Presently he is employed as engineer in training in civil engineering with the British Columbia Electric Railway Co. Ltd.

K. R. Stehling, S.E.I.C., has been awarded the John Galbraith Prize of the Institute for 1948 for his paper on "Rocket Propulsion," which was published in *The Engineering Journal* in March 1948.

Mr. Stehling attended University of Toronto from 1941 to 1943. He served from 1943 to 1945 in the Armoured Corps of the Canadian Army, and he returned then to the University. He received a B.A. degree in 1948. He is now employed by Allied Chemical and Dye Corporation, Buffalo, N.Y., in the plant engineering department; and he is also

M. B. T. George, S.E.I.C.

studying for a M.A. degree in industrial physics at University of Buffalo.

Mr. Stehling became a student member of the Institute as a result of the choice of his paper "Underground Gassification of Coal" to win a student contest. He is president of the Canadian Rocket Society which was founded in 1948; and a fellow of the British Interplanetary Society.

M. B. T. George, S.E.I.C., has been awarded the Phelps Johnson Prize of the Institute for 1948. Mr. George's paper is entitled "Preliminary Design of a Light Racing Airplane."

Mr. George was born at Pope, Manitoba, but was educated in Saskatchewan where he graduated with senior matriculation from Regina Central Collegiate in 1939. Interested in aeronautics, he studied for a year at Aero Industries Technical Institute, Los Angeles, California.

He returned to Canada in 1940 and came to Noorduyn Aviation Ltd., Montreal. He held a position there as group-leader in the engineering department until October 1945 and during this period his work included draughting supervision and production engineering on the Noorduyn Norseman cargo airplane and the Harvard trainer.

In the fall of 1945 he commenced his studies at McGill University in the applied mechanics option, civil engineering department. In 1948 he was awarded a University scholarship; and he is a member of the Phi Epsilon Alpha Engineering Society. In May of this year he graduated with the degree of bachelor of engineering.

During the summers Mr. George has been engaged in liaison engineering and detail design at local aircraft companies. Next fall he hopes to begin postgraduate studies in aeronautical engineering at an American University.

Gerard Gascon, S.E.I.C.

Gerard Gascon, S.E.I.C., has been awarded the Ernest Marceau Prize of the Institute for 1948, for his paper "Exploitation des Gisements d'Ilmenite du Lac Tio".

Mr. Gascon was born in Montreal in 1922 and attended school in Montreal and Terrebonne, Que. He went to Bourget College, Rigaud, Que., where he obtained a B.A. degree, "magna cum laude". He graduated from Ecole Polytechnique, Montreal, in 1948, receiving the degree of bachelor of applied science, with distinction.

He had acquired practical experience in mining during the summer holidays, in 1944 at the Frood Mine, Sudbury, with International Nickel Co.; in 1946 at the Ross Mine, Rammie, Ont., with Hollinger Gold Mine; and in 1947 at Allard Lake and Tio Lake, North Shore, for Kinnco Explorations Company. Since graduation, he has been at the Marquette Iron Range, working as a junior mining engineer with Inland Steel Company.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Hugh Miles Lewis, M.E.I.C., who was prominent in British Columbia shipbuilding, lumbering, papermaking and railway circles since 1910, died suddenly on December 28, 1948, at his home in Vancouver. He was born at Port Arthur, Ont., in 1887.

He had been vice-president and general manager of Sorg Pulp Co. Ltd., Port Mellon, for four years.

Mr. Lewis went to British Columbia 38 years ago while associated with Canadian Northern Railway as an engineer. He served five years with the Canadian Army in the First World War. After his return from overseas he became assistant manager of the Port Arthur Pulp and Paper Company, and he was later given the position of engineer for the Company. In 1929 he joined Provincial Paper Company, but came back to British Columbia and was with Pacific Mills Ltd., at Ocean Falls. He became manager of the south (Vancouver) yard of Burrard Dry Dock Co. Ltd., in 1941. Besides supervising construction of 10,000-ton freighters outfitting of aircraft carriers came under his wing.

In 1942 he was a shipyard operators' representative on the Richard Commission appointed by Ottawa in a West Coast shipbuilding controversy.

Mr. Lewis joined the Sorg firm when wartime shipbuilding contracts ended.

Mr. Lewis became an Associate Member of the Institute in 1920, transferring to Member in 1940.

Frank F. Sefton, M.E.I.C., of Toronto, who passed away on April 5, 1949, had been chief engineer in the Toronto Transportation Commission's rapid transit project.

Mr. Sefton was born in Toronto in 1890, and was educated there. He worked in the western coal fields for several years, before returning to Toronto and joining a firm of surveyors. He entered the Department of Railways and Bridges of the City of Toronto in 1911, and he remained in this work until 1915, when he went overseas with the Canadian Infantry. On his return he did some construction work in Quebec, at Ste. Agathe des Monts, before entering the firm, Smith, Kerry and Chace Ltd., Toronto. He joined the Toronto Transportation Commission soon afterwards, and was made chief draughtsman of the Way Department. He stayed with the Commission until the time of his death.

F. F. Sefton, M.E.I.C.

Mr. Sefton served overseas in the recent war, with the rank of flight lieutenant with the R.C.A.F. He returned to the Commission on his discharge, and was in charge of public utilities subway design for the rapid transit department.

He has been active in the Toronto Branch of the Institute, which he joined in 1921 as an Associate Member. He transferred to Member in 1940.

G. W. Jarvis, M.E.I.C.

G. W. Jarvis, M.E.I.C., of Montreal, died on March 17, 1949, in Montreal after a brief illness. He was chief engineer of McColl-Frontenac Oil Company Limited.

He was born at Hamilton, Ont., in 1907, and studied at Hamilton Technical School and Queens University, graduating in 1930 with the degree of B.Sc. in mechanical engineering. He remained at the University as a lecturer and demonstrator for two years. He joined McColl-Frontenac in .1934 and held various positions on construction and operations until 1943 when he was appointed chief engineer. Under his guidance a most extensive construction programme was carried out, culminating in the erection of the new fluid catalytic cracking facilities in 1948.

Mr. Jarvis joined the Institute in 1931 as a Student, transferring to Junior in 1938, and to Member in 1943.

Herschel Eugene Denton, managing director of General Petroleums Ltd., drilling contractors, Calgary, Alberta, died in the Holy Cross Hospital at Calgary, March 30th, 1949.

Mr. Denton was also president of Denton - Spencer Co. Ltd., consulting petroleum engineers, and president of Superior Oils Ltd., a producing company. He was born at Mineral Wells, Texas, in 1907, and graduated from New Mexico Agricultural & Mechanical Arts in 1934 with a B.Sc. in mechanical engineering. He had started working in the oilfields of California in 1926 and continued to do so while completing his university work. After graduation he rejoined the Ohio Oil Company with whom he was first employed in 1930. He rose to field superintendent with that Company in the Wyoming and Montana fields.

Early in 1938 he came to Alberta to take the post of production superintendent with the Anglo Canadian Oil Co. Ltd. in Turner Valley. He is credited with the introduction of many new procedures in drilling and production practice in Turner Valley.

In March, 1941, with Cody R. Spencer, he formed the partnership of Denton & Spencer which carried on a petroleum engineering and drilling consulting practice. Also at this time General Petroleums Ltd. was formed to carry on drilling contracting and Mr. Denton became managing director of this firm. Denton & Spencer was incorporated in 1945 as Denton-Spencer Co. Ltd. to carry on petroleum engineering, and General Petroleums Ltd. under Mr. Denton's management became one of the leading drilling contractors in Canada. In 1946 Mr. Denton was active in organizing Superior Oils Ltd. a producing company which attained an enviable position under his guidance. A few days before Mr. Denton died Superior placed their well at Joseph Lake on production and production figures were sent to the hospital at Mr. Denton's request.

Mr. Denton was always active in fraternal and technical organizations. He was licenced to practise professional engineering by the Association of Professional Engineers of Alberta in 1938 and was registered as a member in 1946. He was also licensed to practise in Saskatchewan. Mr. Denton joined the Engineering Institute of Canada in 1945 and the American Institute of Mining & Metallurgy in 1946. He was a member of the American Petroleum Institute since 1938. He was a member of the Western Canada Petroleum Association and was on the Advisory Committee of the Association to the Petroleum and Natural Gas Conservation Board of Alberta. In 1948 he became a member of the American Association of Drilling Contractors.

News of the Branches

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Border Cities Branch

H. D. Keil, M.E.I.C.
Branch News Editor

W. R. Mitchell, M.E.I.C.
Secretary-Treasurer

On March 11th Mr. John Ness of the Imperial Oil Ltd., addressed the Border Cities Branch of the Institute in the auditorium of the Ford Motor Co. of Canada. His topic was **Canada in the Oil World.**

The oil industry in Canada is about 90 years old and has produced about 60 billion barrels of oil. Of the present Canadian oil reserves 90 per cent are located in Alberta and the North West Territories, the remaining 10 per cent are in Ontario.

Mr. Ness dealt particularly with the discoveries and developments of the Alberta fields and described the Turner Valley and Leduc projects. He mentioned also the future possibilities of the Athabaska tar sands and the use made during the last war of the Norman field located in the North West Territories.

Canada uses more oil per capita than any other country in the world and even with her large oil reserves will continue to import extensive supplies particularly for consumption in the eastern part of the country.

Mr. Ness saw no reason for alarm over the dwindling world oil supplies since only one third the area of the world has yet been penetrated. Furthermore, from the present proven oil reserves we can expect a supply of oil at least equal to the total quantity produced by the oil industry throughout its past 90 years of existence. To augment this supply we can still manufacture synthetic crude oil.

To supplement his talk Mr. Ness showed a film entitled "Search Unending".

Cornwall

G. G. M. Eastwood, M.E.I.C.
Secretary-Treasurer

T. B. Webster, M.E.I.C.
Branch News Editor

Boiler Control was the topic under discussion on February 15 at the regular meeting of the Cornwall Branch. K. D. Sheldrick of the Bailey Meter Company delivered the illustrated lecture which was attended by over 50 people. Branch Chairman R. H. Wallace welcomed the local members of the Institute of Power Plant Engineers who had been invited to hear an address of special interest to operating engineers.

Harold Nickerson introduced Mr. Sheldrick who is the manager of the Montreal branch of his company. Mr. Sheldrick outlined the wide scope of automatic control in industry where its application has improved the quality of product and has reduced costs. In boiler plant operation, automatic control contributes to savings in operating costs, betterment of working conditions, improvement in safety and lessening of smoke nuisances. Mr .Sheldrick illustrated his lecture with lantern slides which showed boilers controlled primarily by steam-flow, air-flow responses to control fuel supply rate and draft with auxiliary corrective actions caused by steam pressure measurement. Details of pilot valves, relays, selector switches, control valves and control panels were clearly illustrated.

Mr. Sheldrick reviewed the rapid advance of process control engineering in the past 30 years and claimed that even greater advances are possible in the next 30 years.

The speaker was thanked by Mr. Nasmyth.

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On March 8 at the Hotel Cornwallis, there was a dinner meeting of the local branches of the Engineering Institute and the Chemical Institute of Canada. The meeting, presided over by D. Leushner of the C.I.C. and R. H. Wallace of the E.I.C. was addressed by E. L. Davies, vice-director-general of the Defense Research Board. Guests at the dinner were the officers of the Stormont, Dundas and Glengarry Highlanders.

Mr. Davies contended that the destructive powers of atomic weapons have been greatly over-publicized by the press. He claimed that the atom bomb's greatest effectiveness in war arose from the psychological fear that it created—comparable to the fear of chemical warfare in the First World War. Mr. Davies also stated that "push-button" warfare is largely a creation in the minds of the press, and warfare is yet far from being completely mechanized.

Radar and DDT are two examples of

scientific discoveries that have been greatly over-rated. Radar is a logical outgrowth of television but its effectiveness is still unpredictable as shown in its failure before the collision of HMCS "Micmac" and the freighter "Yarmouth County."

Mr. Davies told of the great advances made in medical research during the war—advances made possible by the increased money made available for research; the greater need for the care of war casualties; and, most importantly, the greater opportunity for carrying out experiments on large bodies of men under discipline.

The speaker said that experience has shown that directed research is more effective than independent research in attaining success in any one project but that freedom of research is more conducive to new discoveries. He claimed that Russia's directed research programme might well lead to the perfection of a better atomic bomb but that if a weapon better than an atomic bomb were discovered, the chances are that its discovery would be made in a country where freedom of research is practised.

Mr. Davies was introduced by R. H. Wallace and thanked by Captain John Cook.

Lakehead

G. S. Halter, jr.e.i.c.
Secretary-Treasurer

A general meeting of the Lakehead Branch of the Engineering Institute of Canada was held at the Mary L. Black Public Library, Westfort, on Wednesday evening, January 12, 1949. There were 27 members and guests present. W. E. MacLennan, branch chairman, presided, and expressed his pleasure in seeing students of the Lakehead Technical Institute present.

A business meeting dealt with financial and membership reports, and with the announcement of the January regional meeting of Council. D. R. Beckett and J. M. Fleming were named to be, respectively, Eastern district representative of the Branch, and Branch representative on the Institute nominating committee.

Discussion followed, on the subject of the form in which meetings would be organized, and it was remarked that this was an experimental non-dinner meeting. Discussion took place, also, of details of the forthcoming dinner and dance. Mr. A. Paoli of the John Inglis Company, Winnipeg, was an unexpected visitor at the meeting and he kindly consented to give a short talk on **Refrigeration as Applied to Skating Rinks.** The talk was illustrated by isometric drawings and proved to be very interesting. Both sand and concrete surfaces were described and the complete cooling cycle was outlined. Considerable discussion took place after the talk.

W. C. Byers moved a vote of thanks to the speaker. Mr. MacLennan also thanked the speaker, and adjourned the meeting.

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The annual dinner and dance of the Lakehead Branch was held Wednesday evening, February 16, in the Norman Room of the Royal Edward Hotel, with 65 couples present.

Mr. W. E. MacLennan, branch chairman, presided at the dinner and proposed a toast to the King. A. D. Norton was in charge of all the arrangements for the evening and was assisted by the secretary-treasurer, Syd Halter. S. Flook said grace before the meal. Gib Heath designed the original blueprinted menus which were quite appropriate for this engineering affair.

A beautiful rose corsage was given to each lady as she entered the dance floor. There was a large punch bowl at one end of the Norman room and Bill Adamson was in charge there. An illuminated Engineering Institute of Canada shield with beaver insignia was in proud display in a prominent place on the wall of the Norman room.

The dress for the evening was optional. The entire evening had an air of friendly informality and there were no after-dinner speeches.

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A dinner meeting of the Lakehead Branch of the Institute was held in the banquet room of the Orpheum Grill, Thursday, March 17.

H. Bruce MacConnell, m.e.i.c., superintendent of the Barnett-McQueen Company Limited, spoke on **General Estimating in the Building Trade,** as applied to warehouses, factories, schools as well as small dwellings. Mr. MacConnell gave the detailed step-by-step procedure involved in estimating the cost of a building from drawings and specifications. He said that not only must the estimator decide the cost, but he must also decide how long it will take to complete a project.

Considerable discussion took place, and Mr. McConnell informed between 50 and 60 present that the well-known escalator clause in many present contracts was due to the possibility of strikes on the job as well as the increase in the cost of materials between the time of tendering and delivery of the materials to the job.

A. D. Norton, programme committee chairman, gave a financial report on last month's dinner and dance.

Employment of non-Canadian engineers by Canadian companies in certain jobs where Canadian engineers were as well or even better qualified, was discussed in some detail.

Syd Halter, branch secretary-treasurer, advised that negotiations would soon be underway for a co-operative agreement between the Association of Professional Engineers of Ontario and the Ontario Division of the Engineering Institute of Canada. Mr. Halter explained the details involved and advised the group that there were already agreements between five provincial professional associations and five provincial branches of the Institute. Mr. D. Laidlaw moved that such an agreement in Ontario be endorsed. The motion was seconded by M. G. Burbidge and carried unanimously.

W. E. MacLennan, branch chairman, presided and said that it was gratifying to see such a good turnout. Some engineering students from the Lakehead Technical Institute, student members of the Institute, were also present.

Lethbridge

D. Cramer, jr.e.i.c.
Secretary-Treasurer

E. A. Lawrence
Branch News Editor

The regular meeting of the Lethbridge Branch of the Institute Saturday evening, March 19, was addressed by Mr. A. Cullen, on the subject of the Professional Engineering Act of Alberta.

W. Foss presided over the meeting with a large attendance of members and affiliates present. Brown's Instrumental Trio played during dinner, and vocal solos by Mrs. D. Benoit and community songs led by R. S. Lawrence were enjoyed.

E. A. Lawrence introduced Mr. Cullen, who explained the organization of the Association of Professional Engineers of Alberta.

The use of the title, "Engineer", presupposes membership in the Association and Mr. Cullen enumerated conditions under which one may be a "member" or "licentiate" of the Association. He told of the manner in which officers and executive are elected, and of the General Faculty Council, which handles admission. Mr. Cullen discussed, also, various other sections of the Act.

Following an interesting discussion, Councillor for the Association, Mr. J. M. Campbell, thanked the speaker for his excellent address.

Montreal

Junior Section

J. D. McPherson, m.e.i.c.
Chairman

A noteworthy event in the 1949 spring programme of the Junior Section, was a forum on **The Personal Aspects Of Engineering,** March 14. Also of wide interest, was an address by Mr. L. G. Beaubien, on **The Functions of a Stock Exchange,** March 28. Mr. P. H. LaPointe, architect, gave a lecture on **Advances in Building Materials for the Modern Home** on February 28; and Mr. Yvon DeGuise, m.e.i.c., presented an illustrated lecture and film, on **The Beauharnois Project,** on April 11.

Because of its novelty and impressive results; the purpose, organization, and results, of the Forum were reported for the *Journal*.

The forum was organized by Past Chairman Paul Salvas, who acted as discussion leader. Chairman of the evening, J. D. McPherson, introduced the principal speaker, J. B. Sterling, m.e.i.c., vice-president of E. G. M. Cape Co. Ltd., and president of the Corporation of Professional Engineers of Quebec. The chairman noted that amongst students and junior engineers there existed a desire for the knowledge which would enable them to orient themselves in their profession, and relate the professional career to business, industry, and labour. Underlying this is the idea that the economy of human effort attained in working toward well defined goals will enable the young man to achieve a better way of life, and fuller self realization, at an age when lack of this breeds frustration and disillusionment. He noted that the forum was designed to explore some of the personal aspects of engineering; and to this end, the knowledge and experience of a panel of successful engineers was made available to those students and juniors participating.

Mr. Sterling emphasized the importance to the young engineer of personality and character in the building of a successful career, and indicated that a weighted percentage would give these personal qualities 75% as against 25% for knowledge of engineering science

The speakers at recent Montreal Junior Section forum. Left to right, J. B. Stirling, H. C. Nourse, Discussion Leader Paul Salvas, J. A. Lalonde, Dean Ignace Bouillet, and Chairman J. D. McPherson.

and technique of business. He stated that individual success is measured not only by how much we know, but in a far greater measure by how much of it we can put to use, and the manner in which we do it. He pointed out that many graduates had failed to apply the same approach to their personal problems which they as engineers had used with reasonable success in their engineering work.

Mr. Serling suggested that much good would result were student guidance and selection more seriously developed. As a means of building personality, he noted the benefits to be gained by active participation of engineers in professional or business organizations and groups.

Dean Ignace Brouillet, M.E.I.C., dean of the Ecole Politechnique, the second participant in the discussion, outlined how the practising engineer can assist the faculties of the universities in formulating courses or curricula; and made the plea that practising engineers offer more of their time to the universities in the training of students.

Mr. H. C. Nourse, M.E.I.C., described the work being done by student guidance committees of the Institute and told of the opportunities for student guidance offered by the Montreal Branch. Dr. J. A. Lalonde, M.E.I.C., emphasized the importance of younger engineers becoming active in public organizations and community activities. He remarked that the regard in which engineers are held by their fellow citizens can be directly associated with their participation and usefulness in community life.

Following a brief intermission, the panel discussed questions submitted by members of the gathering: this later discussion proved immensely interesting and profitable.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

On Thursday, March 24, members of the branch visited the nickel refining plant of The International Nickel Company in Port Colborne, where they were conducted on a tour through the plant. The trip was arranged with the co-operation of R. C. McQuire, general superintendent of the plant. Guides were provided for small groups, and the manufacturing process was followed from the receipt of the raw material through to the finished product.

The rendezvous following the plant visit was the Barclay Hotel in Welland where about fifty engineers assembled for dinner.

Following the dinner chairman R. A. Coombes officiated at the presentation of the Institute Insignia in the form of a watch fob to past chairman M. F. Ker.

Mr. McQuire gave a short history of the refining of nickel and a brief account of the widespread occurrence of nickel ores on the earth's surface, but pointed out that only a few of the known ore bodies are of the type that are amenable to the presently known refining processes. The speaker then followed with a very complete explanation of the process which is used at the Port Colborne refinery. Many interesting questions arose during the discussion which followed, all of which were satisfactorily answered by Mr. McQuire.

A short session of the executive was held after the meeting, at which the report of the nominating committee was received.

Saguenay

T. T. Anderson, Jr.E.I.C.
Secretary-Treasurer

A meeting of the Saguenay Branch was held at the Arvida High School, on Tuesday evening, March 22, 1949.

The speaker was M. E. Wight, director, Technical Service Division, McColl-Frontenac Oil Company, Limited, Montreal, and his subject was **Lubricating Oils, their Manufacture and Uses.**

Mr. Wight divided his subject into three main phases:

(a) Separation of the crude oil fractions: this section dealt with the refinery methods used to separate the various oil fractions. The functions and construction of the bubble cap tower were clearly explained and slide diagrams shown. The speaker then covered clay filtration and solvent dewaxing.

(b) Means of differentiating between oils: this section dealt with the various tests employed to differentiate and maintain the various types of oil. The speaker spent some time discussing the properties of napthenic and paraffinic base mineral lubricating oils, covering the use of viscosity tests and viscosity index.

(c) Additives — their purpose and functions: this section of the talk dealt with the various chemicals which are added to give desired properties to lubricating oils so that they may meet conditions of service and temperature. Various comparison slides were shown.

Mr. Wight answered many questions following the talk. A capacity audience attended.

On Tuesday, March 29, 1949, at the Arvida High School a series of three films were shown. The films were entitled: "Deep Horizons" — The biography of an oil well; "Masters of Molecules" — The story of a refinery; "Tankers" — The story of wartime oil transport.

These films were a follow up on Mr Wight's talk of March 22, 1949. At that meeting a general power failure had caused postponement of film showings.

The speaker was introduced by Chairman W. P. C. LeBoutillier, and was thanked by F. A. Dagg.

Junior Section

W. A. Dayton, M.E.I.C.
Secretary-Treasurer

A meeting of the Saguenay Branch Junior Section, was held at the Saguenay Inn on March 15, 1949.

The speaker was C. B. Shipton of the Aluminum Company of Canada, who spoke on the **Manufacture of Phosgene** at the Windsor Works of Canadian Industries Limited.

Mr. Shipton discussed the properties of phosgene chemically and physically in order to provide a background for the description of the actual plant process and the inherent dangers when dealing with such a toxic product. He stressed the fact that the plant described was not built to produce phosgene for chemical warfare, but as an intermediate step in the production of a chemical to be used in the manufacture of cordite.

The interest of the audience was demonstrated by the questions asked during the later discussion period.

Mr. Shipton was introduced by the Chairman, T. T. Anderson, and thanked, on behalf of the members, by R. Lewis.

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At a meeting of the Saguenay Branch Junior Section at the Saguenay Inn, on Wednesday, April 6, 1949, the speaker was R. A. Lemieux, M.E.I.C. His subject was **Town Planning, its Nature and Origin.**

Mr. Lemieux began by discussing Arvida, a planned town. In the early days Aluminum Company engineers had looked after planning and administration. However in 1942 authority was turned over to the city council and city administration, which latter Mr. Lemieux heads. In 1943 the administration recommended formation of a Town Planning Commission and the first meeting of the new body was held on October 27, 1943. Throughout the wartime expansion of Arvida the efforts of the Town planners have been invaluable in maintaining order and beauty in the face of greatly accelerated growth.

Mr. Lemieux also spoke of the history of town planning, which goes back as far as early Greek and Egyptian civilizations, and he traced its growth to modern times.

Mr. Lemieux showed that zoning is necessary to provide sanitation, to lessen traffic hazards and fire risk, to prevent overcrowding, to maintain health, security, and improve morale. He showed that a building code was necessary for the safety of occupants and of neighbours and for the safety of buildings. He described the work of the building inspector as being delicate, one in which firmness and courtesy must go hand in hand. He stressed the need for expanded public education along town planning lines.

Following the talk two very interesting films were shown. They were entitled "When we build again", and "This is Tomorrow".

The speaker was introduced by the Chairman and thanked by Laurent Tessier, Jr.E.I.C..

Sarnia

C. P. Sturdee, M.E.I.C.
Secretary-Treasurer

J. M. Garton, Jr.E.I.C.
Branch News Editor

A Television Revolution was the theme of an address delivered by Mr. J. G. Smart of The Canadian General Electric Company to a dinner meeting of the Sarnia Branch of the Institute on March 29, 1949.

The speaker outlined the many ways in which mankind will benefit as television develops. Television receivers are bringing excellent entertainment right into the home, and thus are making a contribution to the present much neglected home life. Selected television programmes will help develop hobbies and talents of such diversity as cooking or improving one's golf. Sports will be enjoyed by much larger audiences than ever before. The speaker mentioned the medical profession's use of television for instructional purposes, where operations can be watched by a large number of students. Top notch instructors in all fields are able to demonstrate and teach to audiences of almost unlimited size through the use of television. In industry, television is being used to observe dangerous scientific experiments such as rocket development and experiments with super-sonic aircraft. In the field of advertising, television is already making great strides. The impact of clever televised advertising is quite impressive, and advertisers are now considering this medium worthy of consideration when spending advertising dollars.

Mr. Smart then outlined the growth of television during the past years. In the United States it is anticipated that by the end of 1949 there will be 2,000,000 receiving sets in operation, compared with 900,000 at the end of 1948. At the present time there are no commercial television transmitters in operation in Canada, but it is estimated that about 10 per cent of Canada's population are close enough to American stations for good reception. As a result, the demand for Canadian manufactured television sets in the Windsor and Niagara Peninsula areas is greater than the Canadian manufacturers can supply. Television receivers now retail in Canada for about $600.

Television in Canada has every indication of becoming a healthy industry. Present plans call for the erection of transmitting stations in Montreal and Toronto in the near future.

Mr. Smart's address was illustrated by slides and a film "Sightseeing at Home". The speaker was introduced by Mr. C. S. Phelps and thanked by Mr. F. F. Dyer.

Saskatchewan

Regina Section

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bing-Wo, M.E.I.C.
Branch News Editor

At the regular monthly meeting of the Regina Section at the Kitchener Hotel on Thursday, April 21, three speakers discussed **The Power Situation in Saskatchewan.**

The first speaker, H. I. Nichol, superintendent, of the Light and Power Department, City of Regina, dealt with power generation in Saskatchewan.

The major steam plants in the province are located in Regina with a capacity of 36,000 kw., Saskatoon with a capacity of 25,000 kw., and Moose Jaw with a capacity of 20,000 kw. The minor steam plants are located at Prince Albert—11,000 kw.; Estevan—7,700 kw.; North Battleford—3,000 kw., and Weyburn—2,200 kw. The Estevan plant will become one of the bigger steam generating plants in the future because of its proximity to the coal fields.

Mr. Nicholl also dealt with diesel plants, of which there are 26 in the province, the major ones at Yorkton—2,250 kw.; Swift Current—2,975 kw.; and Unity—1,930 kw. The speaker also discussed the costs of power generation, pointing out that the two major factors affecting such costs were the cost of fuel and the load factor on the system. He went on with a description of the power network covering the province of Saskatchewan and how the independent networks of the past have been amalgamated into the network of the present.

A. G. Teskey, manager of Canadian Westinghouse in Regina, next dealt with the consumption of power. He said that Saskatchewan occupies a unique place in that it is one of the few places on this continent where all the power is generated by the use of steam and diesels. He quoted comparative costs of power and consumption in the provinces of Alberta and Manitoba as compared with Saskatchewan. The lower cost of power in Alberta due in part to the fact that the plants there are very close to the coal and oil fields and also due to the influence of cheaper hydro-electric power. The Manitoba rates were lower because of the use of hydro and the fact that the farm area is concentrated in an area only about one third as large as that in Saskatchewan.

W. B. Clipsham, engineer, Saskatchewan Power Corporation, dealt with future developments in the province.

The main source of power in Saskatchewan comes from coal. The building of an oil pipeline into Saskatchewan from Alberta fields would displace the use of coal with the exception of the Estevan area, which lies right in a coal field. The use of natural gas in the Unity district was also described. Mr. Clipsham then spoke on possible hydro development in the province. Two sites were possible; the Fort a la Corne site on the Saskatchewan River could develop 42,000 continuous horse power and a peak of 125,000 horse power. The South Saskatchewan River Dam would develop a large amount of power but the bulk of this would be ultimately required to pump irrigation water, although some power would be available for sale during the early development of the project.

Mr. Clipsham illustrated by means of a graph, the growing power demand based on present rates of growth. There were 395 villages in the province with 46% still to be served by the Power Corporation and of the 138,000 farms only 1,776 were served up to last year. With the new loads which might be expected, the power demand in 1960 would be about two times the demand in 1948.

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The regular monthly meeting of the Saskatchewan Branch was held in the Kitchener Hotel, Regina on March 18, 1949.

Mr. A. William, Director of Industrial Development and Mr. J. Bichan, Director of Mineral Resources, Department of Natural Resources, presented papers on the work being carried out by their branches. Mr. S. Lucas, manager of the Saskatchewan Timber Board also presented a talk on the timber industry in Saskatchewan.

Mr. Williams presented a picture of the natural mineral deposits of the province and explained how these were being developed commercially. Of all the natural deposits of commercial minerals in Saskatchewan, those connected with the ceramic industry were most important commercially. The location of these ceramic clays and shale were shown on a map. The method of mining and selling this product was explained by Mr. Williams. A large tonnage of Saskatchewan clays are shipped to the plant at Medicine Hat where it is made into pottery ware and sewer pipe.

Various other minerals were mentioned, sodium sulphate, magnesium sulphate, sodium chloride, bentonites, volcanic ash, marl and ochre, being among these. Mr. Williams discussed each of these and their possible commercial value.

Mr. Bichan spoke on mining and prospecting being carried on in the province. Saskatchewan was later in the development boom due in large part to the natural barrier formed by a forest belt which covers the north central part of the province. It was only within the last three years that a suitable road had been constructed into this area.

Mr. Bichan spoke of the important uranium discoveries made in Saskatchewan. Three definite fields have been located at Goldfields, Lac la Ronge and Black Lake. The geological formation in the area is favourable to the deposition of pitchblende and there appears every likelihood of further discoveries being made during the coming year. Saskatchewan holds first place among the provinces in uranium exploration and development.

The petroleum industry was also mentioned. The large number of drilling and exploration permits being issued would put Saskatchewan second only to Alberta in the search for oil.

Mr. Lucas spoke on the timber industry in Saskatchewan. He mentioned the conservation practice that is necessary in order that a sustained yield of our forest be possible. It was pointed out that a period of 80 to 140 years is required for a tree to reach maturity and unless a planned programme of cutting was used, the forests would rapidly become depleted.

Spruce trees are the most plentiful in Saskatchewan as a commercial tree along with good stands of jackpine and birch. The aspen and poplar trees are considered as a weed tree although poplar is being used in the manufacture of plywood at the Hudson Bay plant.

Mr. J. Mantle, secretary of the Saskatoon Section moved a unanimous vote of thanks to the three speakers for their interesting and informative addresses.

Saskatoon Section

J. B. Mantle, M.E.I.C.
Secretary

On Thursday, March 17, 1949 the Saskatoon Section held an informal smoker with four local engineers talking on various topics of engineering interest. Some 65 members were present to hear these informative papers.

Herb Bear of Richardson Road Machinery Company elaborated upon the **Design and Development of a Rotary Snow Shovel.** This piece of equipment could be readily attached to farm tractors for use in clearing country roads. The final shovel design was of the rotating blade type driven from the tractor power take off. It was capable of clearing 5,000 cubic yards of freshly fallen snow per hour.

Walter Ball of the Housing Research Center discussed the features of **Prestressed Concrete Design.** Mr. Ball had visited the experimental laboratories at the University of Ghent and he described what he had seen there. He employed a hypothetical slab bridge design to illustrate the large savings in weight that could be obtained with prestressed concrete.

Stan Hartridge of Hi-Way Refineries, under the topic **What's New in Refining?**, traced the history of oil refining, and went on to discuss the plans for a projected new refinery to be erected in Saskatoon. This plant was to include a 1500 barrel per day straight-run unit and a 500 barrel per day cracking unit for refining crude from the new Alberta fields. The refinery was being designed and built by a firm of engineering contractors in the U.S.A.

A. B. Olsen of the Saskatchewan Power Corporation discussed his experience with **Oil Firing of Boilers** in the Saskatoon Plant. While being expensive to operate he felt that the use of oil in stand-by equipment was highly desirable.

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On March 31, 1949, the Saskatoon Section combined its Annual Meeting with a Smoker and drew an attendance of 35 members. Dr. D. L. Gibson of the University Dairying Department was the guest speaker on this occasion and he elaborated on the plans and projects for The New Soils and Dairy Laboratory at the University. A considerable amount of refrigeration was required for their work and they planned on using either Freon 12 or 22 as the refrigerant. Two five horsepower and two fifteen horsepower compressors were being installed. Some of their research work was to be in the fields of powdered milk, ice cream manufacture, domestication of foreign cheeses and preservation of dairy products in ration packs. Vern Friebel ably expressed the appreciation of the assembled engineers for a most informative and interesting talk.

The secretary, J. B. Mantle, then reported on the activities of the Section during the past year. This report showed that $117.00 had been expended during the past year in presenting seven meetings (average attendance 75) and other undertakings to increase the interest of students in the affairs of the Association and Institute. During the year 65 technical films were shown to engineering students during noon hours with an average attendance of 160. A special vote of thanks was given to student Bob Haid for his work in connection with these film showings. The number of undergraduates who were either student members of the Institute or the Association approached 250 at the time of the report. Elections of officers for the 1949-50 term resulted in W. R. Staples being returned as Secretary, and Walter Ball and A. B. Olsen assuming membership on the Programme Committee. Provision was made for the election of a student member to the programme committee at the first meeting in the Fall.

Sault Ste. Marie

N. Bachynski, Jr.E.I.C.
Secretary-Treasurer

The first meeting of the Sault Ste. Marie Branch for the 1949 season featured a dinner meeting at the Windsor Hotel on Friday, March 4th. The guest speaker, Mr. Ralph W. Stickney, welding engineer with the Canadian Welding Bureau presented an interesting paper on **The Purposes and Activities of The Canadian Welding Bureau.** Included in the audience were members of the Algoma Welding Society who attended the meeting as guests. The speaker was introduced by the chairman, D. C. Holgate.

Mr. Stickney said the prime purpose of the Canadian Welding Bureau is to set up welding standards in this country. The progress of welding depends on sound, safe welding and this can be obtained by applying accepted welding codes.

The speaker gave briefly the history of welding which led to the vital part it played in World War II. Large projects such as Mulberry Harbour, the construction of aircraft, tanks and ships, were cited as evidence of the increasing prominence being obtained by welding in the fabricating world.

In peace time, Mr. Stickney stated, with the growing industrial demands on welding, it is dangerous to have many trained in welding but few in the limits of welding. To overcome this undesirable condition fabricating firms should have: proper engineering; proper supervision; qualified operators; correct welding material and equipment; and suitable welding standards and procedures. Mr. Stickney concluded by emphasizing that the purpose of the Canadian Welding Bureau is to approve fabricating firms and to serve industry and welding in every possible manner.

The talk was followed by a discussion period and the speaker was thanked by Mr. C. Stenbol of the Algoma Steel Corporation.

Vancouver

Alan Fletcher Jr.E.I.C.
Secretary-Treasurer

Stuart A. Lefeaux, Jr.E.I.C.
Branch News Editor

On Tuesday, March 22nd members and friends of the Vancouver Branch were favoured with a talk on **The Principles and Practice of Materials Handling Equipment** given by Mr. A. F. Anjeskey at the Theatre Under the Stars Building auditorium. George Allan introduced Mr. Anjeskey, an electrical engineer, and general sales manager of the Cleveland Crane and Engineering Company, Tramrail Division.

The speaker assured his audience that he was not giving a sales talk on his product but wished to consider the subject from an engineer's point of view. Materials handling equipment is not essentially for labour saving but for "labour aiding"; heavy lifting by mechanical means and elimination of waste handling and waste space. The increase in production resulting from extensive use of handling equipment is a large factor in the keeping down of unit costs. Mr. Anjeskey gave many examples of the use of overhead installations in the paper and automotive industries; he criticized the railroads for not providing top-loading box cars for efficiency in loading and unloading.

Modern industrial and storage building plans should provide for overhead crane installations; warehouses should have floors capable of withstanding the heavy loads resulting from overhead handling and high stacking of materials.

Colonel Sherman, M.E.I.C., thanked the speaker for his most interesting treatment of the subject and all agreed the meeting was valuable to engineers interested in manufacturing or handling of materials.

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Members of the Vancouver Branch welcomed the opportunity of making a field trip to the MacMillan Industries Plywood Plant and the Canadian White Pine Sawmill on Wednesday, April 6th. Approximately forty members turned out for the complimentary luncheon at the plant cafeteria and afterwards divided into groups to inspect the plywood plant and sawmill.

The plywood plant, situated on the North Arm of the Fraser River, has 187,000 square feet of factory floor area and has a production rating of 120,000,000 square feet of ⅜-in. plywood annually and 35,000 plywood-faced Mono-dors monthly. The plant contains three lathe units or "peelers" capable of handling logs up to 8 ft. 6 in. diameter and 10 ft. 6 in. length with a speed of 400 lineal feet of veneer per minute. Transfer tables transport the veneer from lathes to clippers where the sheet is cut to selected size. The veneer passes through the dryers, patching, jointing and sorting to the presses where various thicknesses are assembled; panels are then trimmed and inspected before final sanding and packaging.

The sawmill is made up of three individual sawmill plants; "A" mill with band saw and Swedish gang saw unit for long-cutting and specialties, "B" mill with band saw for large diameter logs and "C" mill with Swedish and sash gang saws for small diameter logs. Steam for lumber dry kilns, plywood driers, and turbines is produced from "hogged" waste from the mills; average steam production is 100,000,000 pounds per month. Approximately one half of the total single-shift capacity of 10,000,000 board feet per month is planed for domestic and export production.

All members present expressed their appreciation for the hospitality of MacMillan Industries Limited, and professed a much better knowledge and understanding of lumber and plywood production. The hard-working chairman, George Allan, proved capable once again of providing a topic of great interest to members.

Victoria

D. A. MacLean, jr.e.i.c.
Secretary-Treasurer

T. A. J. Leach, m.e.i.c.
Branch News Editor

E. G. Oldham, Forester in charge of the recently created Parks Division, British Columbia Forest Service, gave an interesting talk on **Recreation in British Columbia** to the Victoria Branch at Prince Robert House on Friday, March 18.

The speaker reviewed the history of recreation.

Today the necessity for leisure has grown more important because more free time is available and the strain of modern life is great. In 1840 the majority of young men worked 72 hours a week while today the average working week is only 40 hours. The nature of work today is much more scientific and is concentrated into special lines with the result that work, generally, is more tiring mentally.

The setting aside of park areas for recreation in British Columbia dates back to the beginning of the century but it was not until 1934 that any vigorous effort was made to improve these park areas. At that time the Provincial Government started employing young men in a forestry training programme. This was continued until the outbreak of the war in 1939 when development came to a standstill.

Today, Mr. Oldham said, there are 10,808,120 acres in British Columbia devoted to recreational purposes and that most of these facilities were for people in the lower income brackets.

To encourage recreation within these parks, permits are granted for the building of homes and hunting lodges. To maintain the high standard, all building concessions are constructed and owned by the Government. They are, in turn, leased to individuals who operate them.

The long term planning of parks must take into consideration the population trend. For this purpose, reconnaissance surveys are made around the populated areas, and a master plan is evolved. Mr. Oldham pointed out that the State of New York park plan has been taken as a model, with certain modifications, for British Columbia.

Plans for 1949 programme include the building of jeep trails through the parks and the spending of $205,000 on the Mt. Seymour area.

Following his talk Mr. Oldham showed colored films of recreational spots in British Columbia.

The annual dinner dance of the Winnipeg Electrical Section. Above, the head table, left to right, C. V. Antenbring, branch chairman; Mrs. A. M. Thompson; Mrs. E. P. Fetherstonhaugh; Prof. J. A. Russell, the guest speaker; A. M. Thompson, Electrical Section chairman; Mrs. J. A. Russell; Dr. E. P. Fetherstonhaugh; Mrs. C. V. Antenbring.

Below: A general view of the meeting.

R. Bowering, Chairman, presided and a vote of thanks was moved by G. Irwin, which was heartily endorsed.

Winnipeg

G. W. Moule, m.e.i.c.
Secretary-Treasurer

Electrical Section

J. C. Pratt, m.e.i.c.
News Editor

The Annual Dinner and Dance of the Electrical Section was held on March 4. The guest speaker, Professor J. A. Russell, director of the School of Architecture and Fine Arts at the University of Manitoba spoke on the subject **Your Home Designed for Living.** Professor Russell was introduced by R. Noonan, Vice-Chairman of the Section, and following the talk which was very well received by both the ladies and gentlemen present, E. M. Scott moved a hearty vote of thanks to the speaker.

A. M. Thompson, Section Chairman presided. D. A. McCuaig and E. M. Scott were in capable charge of the arrangements.

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A. M. Thompson, recently elected chairman of the Electrical Section, has been transferred to the Montreal Office of the Canadian General Electric. R. Noonan, who was the Section's vice-chairman, has agreed to fill the vacancy.

At the April 7 meeting, the Electric Section had the pleasure of hearing W. A. Trott give a very stimulating talk on **Light as Radiant Energy.** The address covered the psychological and physiological effects of radiation on human and other forms of life. It pointed out that the effects caused by the action of "seeing" form only a small part of the total effects of radiant energy on the body.

Mr. Trott is vice-president of Lighting Materials Ltd., president of Geetee Ltd., and a partner in the firm of Greenlaw and Trott, consulting engineers.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

April 26th, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate *

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the June meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ALEXANDER—ARTHUR FRANK, of Port Hope, Ont. Born at Saskatoon, Sask., Dec. 8, 1910. Educ. B.Sc., (Mech.), Sask., 1936; R.P.E., Ontario; 1936-37 design dftsman., road grading equipt., etc., Richardson Road Machinery Co., Ltd., Saskatoon, Sask.; 1938-40, plant engr. i/c genl. engrg., design of dairy equipt., stainless steel tanks, etc., C. Richardson & Co., Ltd., St. Mary's, Ont.; 1940-41, asst. engr., admin., engrg. design of power plant feed, water equipt., pressure tanks, Canadian Allis-Chalmers Co., Ltd., Toronto; 1941-42, Mathews Conveyer Co., Ltd., Port Hope, Ont. 1942-46, F/L., R.C.A.F., finally Aircraft Develop't & Mtce. Engr., H.Q., Ottawa; 1946 to date, engr. specialist belt, roller & pusher bar conveyers, layout and design of conveying & pkge. handling equipt., Mathews Conveyer Co., Ltd., Port Hope, Ont.

References: H. A. Lancefield, J. S. Houghton, K. N. Lockhead, B. H. Russell, J. B. Mantle.

CASE—HARRY FRANK, of Ottawa, Ont. Born at Southampton, England, Feb. 15, 1923. Educ.: Higher National Certificate in Mech. Engrg., 1938-42 (at Univ. of Southampton, Eng.); 1938-42 engr. apprent., John I. Thornycroft & Co., Southampton, Eng.; with Anglo-Saxon Petroleum Co., London as follows: 1942-43, jr. i/c Marine diesel mchny., 1943-44, 4th engr. officer i/c operation of boilers, auxiliaries, etc.; 1944-45, 3rd engr. officer i/c operation of steam machny. boilers, elect. power generation, dist. mtce., Anglo-American Oil Co., Ltd., London; 1945-48, 3rd & 2nd engr. officer i/c machny. operation mtce., etc., Furness Withy & Co., London Eng.; 1948-1949 (Jan.), plant engr. & asst. to plant mgr., Gould Storage Battery Mfg. Ltd., Kingston; 1949 to date, engr. & sr. dftsman., J. H. Connor Co., Ottawa, Ont.

References: L. F. Grant, R. A. Low, W. R. Peck, S. H. Wilson, J. C. Elliott.

CHAPMAN—FRANCIS HERBERT, of Vancouver, B.C. Born at Leighton Buzzard, England, July 18, 1902. Educ.: B.Sc., (Metall. Engrg.), Queen's, 1926; R.P.E., B.C.; M., C.I.M.M.; 1924, genl. duties, reduction plant, International Nickel Co.; 1924-25, successively, chief cyanide operator and plant research asst., Deloro Smelting & Refining Co.; with Consolidated Mining & Smelting Co. of Canada, Trail, B.C., as follows: 1926-28, assayer, 1928-29, concentration research engr., 1929-45, tech. sec., research board, 1945-46, executive sec., research & development board & supt., research planning & information dept., 1946-48, sr. research engr. on metal projects (for one year, 1937, tech. advisor on International Smoke Arbitration for Trail smelter); at present, executive sec., Assn. Prof. Engineers of B.C., Vancouver, B.C.

References: A. H. W. Busby, R. W. Diamond, J. V. Rogers, P. B. Stroyan.

CLEMENT—GORDON KELSO, of Arvida, Que. Born at New Westminster, B.C., Feb. 11, 1916. Educ.: B.A.Sc., (metall.) Toronto, 1943; 1937 and 1938 (summers), rodman, inspector, Dept. of Highways, Ontario; with International Nickel, Copper Cliff, as follows: 1939-40, lab. tech., 1941-42, test engr., 1943-44, jr. metall.; 1944-45, instructor, Dept. of Mining Engrg., Univ. of Toronto; 1945-46, prod. supvr., John Inglis Co., Toronto; at present, supvr., i/c fluorspar concentration and sulphuric acid prod., Aluminum Co. of Canada, Arvida, Que.

References: G. T. Malby, F. G. Barker, G. M. Mason.

COLVILLE—ROBERT GAULT, of Montreal, Que. Born at Lachine, Que., June 21, 1915. Educ.: B.Engrg., N.S.T.C., 1939; Robb Engineering Works, Ltd., Amherst, N.S., as follows: 1934 (summer), structl. & machine shops, 1935-36, structl. dftng., 1937-38, boiler dftng.; with Foster Wheeler, Ltd., St. Catharines, Ont., 1939-40, boiler stoker dftsman., 1940-42, erection supt., 1942-44, service engr., 1944-46, sales & service engr., Montreal, 1946 to date, sales engr., boilers, stokers, pulverized fuel systems, etc., process designer for food and other industries, Montreal.

References: J. E. Neilson, A. D. Smith, G. N. Martin, F. J. Raskin, R. F. McAlpine.

DAKINIEWICZS—STANISLAW, of Montreal, Que. Born at Trzeciany, Poland, January 3, 1912. Educ.: Civil Engr. Politechnika Lwowska, Lwow, Poland, 1935; Member Assn. Polish Engineers in Canada; 1936-37, asst. to Prof. Boguchi, Dept. of Engrg., Lwowska; 1937-39, designer engr., Polish-French Railway Co., Paris; 1939-48, chef d'etudes, French National Railway Co., Paris; 1948 to date, building inspector, Canadian Pacific Railway Co., (in winter transferred to chief engrg. office, Windsor St. Station, Montreal, Que.

References: Z. J. Zokkiewicz, J. Pawlikowski, B. Szczeniowski, W. Golubowski.

DEMIANIW—DONALD GEORGE, of Shawinigan Falls, Que. Born at Semons, Sask., April 7, 1926. Educ.: B.Eng. (Chem.), Sask., 1948; 1945 (summer), jr. rodman, Geodetic Survey of Canada, Ottawa; 1946 (summer), genl. duties, International Nickel, Copper Cliff; Shawinigan Chemicals, Shawinigan Falls, Que.: 1947, (4 mos.) research asst., and at present, chem. engr., plant research dept.

References: M. Eaton, H. K. Wyman, C. R. Morris, J. S. Whyte, I. M. Fraser.

DYE—WILLIAM, of Vancouver, B.C. Born at Glasgow, Scotland, Apr. 30, 1919. Educ.: Regent St. Polytechnic, 1936-39; Ordinary & higher National Diplomas in mech. engrg.; 1938 (summer) dftsman., Trussed Concrete Co., Ltd., England; 1939 (4 mos.), res. engr., N. G. Gedye, consultg. engr.; 1939-1946, Royal Engineers; with N. G. Gedye, consultg. engr., England, 1946-47 (8 mos.), engrg. assist., 1947 (6 mos.), res. engr.; 1947 to date, constrn. engr. B.C. Electric Rly. Co., Ltd., Vancouver, B.C.

References: J. E. Macdonald, F. M. Cazaler, J. Miller, H. T. Libby, J. P. Frazer.

FOSTER—GEORGE KENDALL, of Halifax, N.S. Born at Halifax, N.S., March 25, 1921. Educ.: B.Eng. (Mech.) N.S. Tech. College, 1948; 1940, (summer), surveyor, Dept. National Defence; 1941, (summer), jr. engr., Eastern Car Co.; Maritime Telephone & Telegraph Co., Halifax; 1946 & 1947, (summers), surveyor, and at present, engrg. asst.

References: I. P. Macnab, J. R. Kaye, P. A. Lovett, A. D. Foulis, W. E. Jefferson, J. B. Hayes.

GERMAN—JOHN GORDON, of N. Vancouver, B.C. Born at Montreal, Que., Aug. 26, 1922. Educ.: S.B. (Naval Arch. & Marine Engrg.), M.I.T., 1944; M.Sc., Univ. of Michigan, 1947 (both acc. E.C.P.D.); 1941, (summer), asst. to outfitting supt., Marine Industries; 1944-45, Lieut., R.C.N.V.R., Dept. of Naval Construction; 1948 to date, res. supervisor, i/c West Coast Office, supervision Frigate conversion for Gov't. of India, presently under way in Vancouver, German & Milne, Vancouver, B.C.

References: J. B. MacDonald, H. H. German, J. A. Webster, D. McRoberts, E. W. Izard.

GISSING—HAROLD RODERICK, of Winnipeg, Man. Born at Merritt, B.C., Oct. 20, 1912. Educ.: B.A.Sc., (Elect.), B.C. 1937; R.P.E., Manitoba; with Northern Electric Co., as follows: 1937-38, order servicing; 1939-41, special orders & quotations; 1941-42, office & credit supvr., Calgary; 1942, testing dept., Montreal factory; 1942-45, design and development, test equipt.; 1945, radio broadcast engrg., systems, municipal signals, traffic, etc.; 1946, industrial heating and infra red testing; 1946-49, sales engrg. & field engrg., radio broadcast, public address, industrial heating, etc., at present mgr., electronics divn. industrial heating divn., sales & engrg., Winnipeg, Man.

References: I. W. Beverly, V. C. Jones, R. A. Marvin, J. D. Peart, L. G. Scott, A. Sandilands, T. E. Storey, C. P. Wright.

GULOIEN—EDWARD PERRY, of Shawinigan Falls, Que. Born at Wadena, Sask., July 16th, 1921. Educ.: B.Sc. (Mech.) Sask., 1947; 1942, (Feb.-Oct.), engr's. helper, Hudson's Bay Mining & Smelting, Flin Flon, Man.; 1943, (summer), 3rd operator, Hudson's Bay Mining & Smelting Co., Island Falls, Sask.; 1945 & 1946, (summers), instru'man, electrician's helper, City of Saskatoon; 1947 to date, planning & scheduling engr., alkali works, Canadian Industries, Ltd., Shawinigan Falls, Que.

References: A. S. Holder, I. M. Fraser, E. K. Phillips, N. B. Hutcheon, R. A. Spencer.

HAFFEY—JAMES JOHN, of Valleyfield, Que. Born at Toronto, Ont., June 23, 1917. Educ.: B.A.Sc. (Chem.), Toronto, 1939; R.P.E., Quebec; 1939-41, chief chemist & acid supervisor, Nobel plant, Candn. Industries, Ltd.; 1941-42, shift supervisor, Defence Industries, Ltd., Nitro, Que.; 1943-45, asst. to chief engr., Candn. Synthetic Rubber, Sarnia, Ont.; 1945 to date, chief engr., Canadian Shenley Ltd., Valleyfield, Que.

References: R. Belanger, N. Fodor, C. E. Hogarth, F. F. Walsh, F. B. Booz.

HOULIHAN—ROBERT THOMAS PATRICK, of Winnipeg, Man. Born at Rainy River, Ont., May 20th, 1918. Educ.: B.Sc. (Elec.), Alberta, 1941; Canadian Westinghouse Co. Ltd., 1941-42; engrg. shop test course, Hamilton, 1942 (7 mos.), switchboard design; 1942-43, induction motor design; 1943-46, apparatus correspondence; 1944-45, Elect. Lieut. R.C.N.V.R.; 1946 to date, app. sales engr., Canadian Westinghouse, Winnipeg, Man.

References: H. A. Gooch, D. Hunter, E. E. Orlando, R. Noonan, R. T. Harland, M. D. Young.

LEHMAN—ARTHUR JEAN-JACQUES, of Montreal, Que. Born at Erstein, France, June 5th, 1908. Educ.: Diplom d'Ingenieur Electricien, Ecole Superieure d'Electricite, Paris, 1930; with French National Railways, as follows: 1931-33, (training), driving of steam and gas locomotives, 1933-37, asst. supt. traffic and repair shops, 1939-48 supt. traffic and repair (1942-46, at Colmier, 1946-48, Bar-le-Duc, responsible for rly., these plants with about 75 locomotives and staff); at present, layout of elect. substations, Bedard-Girard, Montreal, Que.

References: A. Frigon, W. Cooper, N. Hartmann, I. Brouillet.

LINTON—COURTLAND BELMONT, of Edmonton, Alta. Born at Port Arthur, Sept. 29, 1902. Educ.: Univ. of Alberta, 1925-28; 1919-28, (summer work), chainman to asst. engr., Banff-Windermere Highway, road constrn. and mtce. of townsites in all of Dominion Gov. Parks (Western Canada); with Calgary Power Co., as follows: 1928-30, survey and instlns. trans. and dist. lines, waterworks and sewer systems, 1930-49, responsible for all survey work, trans. and dist. systems, right of way, etc., Edmonton, Alta

References: J. C. Dale, H. LeBourveau, D. A. Hansen, J. G. MacGregor, P. Hargrove.

MEAGHER—GEORGE VINCENT JOSEPH, of Vancouver, B.C. Born at Halifax, N.S., April 23, 1919. Educ.: B.Eng. (Mech.) McGill, 1942; R.P.E., B.C., 1940, (summer) inspector of construction, Dept. of Public Works, Halifax; 1941-42, (summers), Imperial Oil Ltd., Halifax; 1942-45, National Research Council, assumed prof. responsibility on selection, design and instn. of test equipt. and test work at engine lab., Montreal Road lab., mech. engrg. divn. (asst. lab. head during last year of period); 1945-46, design engr., development special logging equipt. for eastern and other light timber; 1946 to date, genl. consultg. work for self, Vancouver, B.C.

References: H. P. Archibald, J. H. Parkin, L. E. Mitchell, J. S. Ball, D. S. Smith.

McCONNELL—WILLIAM WALTER KNIGHT, Lt. Col., of Ottawa, Ont. Born at Toronto, Ont., June 8, 1916. Educ.: Graduate R.M.C., Kingston, 1938; B.Sc., (Civil), Queen's, 1939; R.P.E. Ontario; 1939, Works Officer, Kingston area; 1939-40, First FD. Coy, RCE.; 1940-41, Adjutant First Cdn. Corps Tps., Engrs.; 1942-44, Sr. Staff Officer to Chief Engr., First Cdn. Corps; 1944-45, Officer/C., First Fd. Coy., R.C.E.; 1945, Sr. Staff Officer to Chief Engr., First Cdn. Army; 1946-48, Sr. Engr. Officers, Camp Borden; 1948 to date, asst. Director of Works & Accn., Army H.Q., Ottawa, Ont.

References: G. R. Turner, J. L. Melville, H. W. Love, W. A. Capelle, M. C. S Brown.

PAGET—ARTHUR FRANCIS, of Kelowna, B.C. Born at Tuxford, Sask., May 2, 1907. Educ.: Private study; R.P.E., B.C.; 1923-31, axeman, rodman, instru'man., res. engr., C.P.R.; 1935-41, supt. and mgr., Keremeos Irrigation District; Works Officer and asst. Dist. Engr. Officer, R.C.E.; 1946-47, asst. city engr. and bldg. inspector, Corp. of the City of Vernon, 1947 to date, asst. engr. and finally dist. engr. Water Rights Branch, Dept. of Lands & Forests, Prov. of B.C., Kelowna, B.C.

References: W. Ramsay, H. L. Cairns, J. H. A. Stevens, C. J. L. Sanderson, R. C. Farrow, D. K. Penfold, J. R. Paget, T. F. Francis.

PIERCEY—ALEXANDER GEORGE A., of Turney Valley, Alta. Born at Calgary, Alta., December 10, 1913; Educ.: B.Sc., (Chem. Engrg.) 1935; M.Sc. (Chemistry) 1938, Alberta; R.P.E., Alberta; 1935, geological survey of Canada; 1936-38, graduate study, University of Alberta; with Royalite Oil Co. Ltd. 1938-43, lab. staff, testing & operation of gas absorption plant etc.; 1943-46, chief chemist, i/c control lab. for gasoline plant operation and field sample testing & production estimates etc.; 1946 to date, chief chem engr. i/c control lab. for gasoline and scrubbing plants, operation, pipeline corrosion, steel inspection etc., Madison Natural Gas Co., Turner Valley, Alta.

References: F. Beach, S. G. Coultis, J. J. Hanna, R. G. Laird, G. D. Phelps, H. Le M. Stevens, J. W. Young.

ROBIC—RAYMOND ANDRE, of Montreal, Que. Born at St Malo, France, March 24, 1899. Educ.: 1913-16, Montreal Technical Schoool (electricity & industrial designing); Member, Societe des Ingenieurs Civils de France; 1915-16, Montreal Locomotive Works, toolmaker; 1916-17, Canadian General Electric, Peterboro; 1917-18, Pigeon, Pigeon & Davis, patent attorneys, Montreal; 1918-49, Marion & Marion (patent attorneys), finally owner; during this latter period Mr. Robic was associated with the following: Linton, Kellogg, Robin & Bastien, patent attorneys, Washington, D.C., Robin & Bastien; general propagandist of technical education; La Salle Conservatory, Univ. of Mtl.; Corporation of Technicians of the P. of Q.; 1945, professor at Laval Univ.; 1941-44, Industry and Subcontract Division, Dept. of Munitions and Supply; 1943-44, Quebec Shipyards, Director of Personnel; 1944-45, Economic Advisory Board, P. of Q.; 1945, Dept. of Reconstruction, Ottawa; at present, Director of Marion & Marion; President, Associated Agencies Ltd., and Swanex Sales Reg'd.; Vice-Pres., Laboratories, Welclier-Lapointe Ltee., Artistic Decalcomania Ltd.; Director, Robic & Bastien, patent attorneys, Montreal. (Asks for Affiliate).

References: E. N. Gougeon, G. Rousseau, F. R. Rousseau, H L. Clifford, P. P. Vinet, L. A. Duchastel.

SOLINSKI—STANLEY THOMAS, of Arvida, Que. Born at Winnipeg, Man., Dec. 10, 1925. Educ.: B.E. (Chem.), Sask., 1948; 1948 to date, jr. engr., Aluminum Co. of Canada, Ltd., Arvida, Que.

References: R. A. Spencer, D. P. Featherstonhaugh, D. F. Nasmith, I. M. Fraser, F. G. Barker, G. M. Mason, T. T. Anderson

STARK—JAMES CURRIE, of Calgary, Alta. Born at Calgary, Alta., June 13, 1921. Educ.: B.Sc. (Petroleum Engrg.) Univ. of Oklahoma 1947 (acc. ECPD); 1948 to date, sales engr. The National Supply Co. Ltd., Calgary, Alta.

References: A. B. Geddes, B. H. Corey, H. W. Tooker, G W. Webster.

TEMPLETON—JAMES BULSTRODE, of Toronto, Ont. Born at Toronto, Ont., June 2, 1922. Educ.: B.A.Sc. (Mech.), Toronto, 1946; R.P.E., Ontario; 1946-47, contract engr. Canadian Ice Machine Co. Ltd.; 1947-48, design & development engr., Multiple Refrigeration Products Ltd.; 1948 to date, Instructor Dept. of Mechanical Engrg. Univ. of Toronto.

References: G. R. Graydon, Prof. G. R. Lord, Prof. R. C. Wiren, F. G. Ewens, R. T. Waines.

TERNAN—JAMES GERALD J. B., of Halifax, N.S. Born at Bedford, N.S., July 9, 1913. Educ.: B.Eng. (Elect.) N.S.T.C., 1939; 1940-41, elect. instructor, Prov. of Nova Scotia, apprent. training; 1941-45, elect. instructor, N.S. War Emergency Training; 1945-47, same position, N.S. Rehab. Training; Nova Scotia Tech. Coll., as follows: 1947-48, elect. instructor; 1948 to date, instructor in elect. engrg. and registrar.

References: M. L. Baker, G. H. Burchill, C. E. Grant, D. S. Nicol, B. F. Vail, A. E. Cameron, F. H. Sexton.

THOMSON—RONALD MATHESON, of Windsor, Ont. Born at Port Arthur, Ont., Aug. 19, 1924. Educ.: B.Sc. (Mech.), Queen's, 1947; R.P.E., Ontario; H.E.P.C. of Ontario, 1945 (summer), student operator in training, Cameron Falls, Ont.; 1946 (summer), mech. mtce. helper, Cameron Falls, Ont.; 1947-48, tire technician, develop't. of specifications for tires and tubes, quality control work, etc., B. F. Goodrich Rubber Co. of Canada, Kitchener, Ont.; 1948 (November), to date, jr. engr., mfg. & assembly dept., export divn., Ford Motor Co. of Can., Ltd. Windsor, Ont.

References: J. G. Hoba, J. W. Greason, H. Lillie, W. D Donnelly, J. E. Daubney.

TUPPER—KENNETH FRANKLIN, of Deep River, Ont. Born at Lynn, Mass., U.S.A., July 21, 1905. Educ.: B.A.Sc., Toronto, 1929; M.Sc., (Aero. Engrg.), Univ. of Mich., (acc. E.C.P.D.), 1933; R.P.E. Ontario, Assoc. Fellow, Royal Aero. Society; Assoc. Fellow, Inst. of Aero. Sciences; 1926-27-28 (summers), topo. survey parties, Geological Survey of Canada; 1929, (9 mos.), dftsman., Riverside Iron Works, Calgary, Alta.; with National Research Council, as follows: 1929-39, Jr. engr., design of aero. labs., various research projects, 1939-42, design of certain parts of Montreal Road labs., 1943-44, jet engine projects, 1944-46, chief engr., Turbo Research Ltd., 1946-47, deputy director, Chalk River lab., 1947 to date, director, engrg. divn., Atomic Energy Project, N.R.C.

References: C. J. Mackenzie, J. H. Parkin, J. T. Dyment, J. W. Lucas, I. N. MacKay, H. S. Milne.

VIKMANIS—ALFREDS, Montreal, Que. Born at Naukshenì, Latvia, January 31st, 1913. Educ.: Civil Engr. University of Latvia, 1938; 1931-38 during study, asst. engr. Latvian State Rly.; 1938-41 engr. later st. engr. Municipal Board of Riga, building dept. subsection of bridges, design and constrn. of several reinforced concrete and timber bridges in capital Riga, in that time for six months occupied as designer of bridges by a highway designers' team in Riga; 1941-44 structural engr. structural design of wooden, steel and reinforced concrete constrns. for States Rly. and industrial plants in Riga, incl. complete rebuilding and enlargement of a cement mill, for Civil Engr. Ed. Luhss, Contractor, Riga; 1945-47, private practice as civil engr. Muldorf and Wuerzburg, Germany, 1947-48, constrn. engr. mtce. and rehab. of bldgs. International Refugee Organization Area 3, H.Q. Wuerzburg, Germany; at present structural draughtsman and designer, reinforced concrete, structural dept., Stadler, Hurter & Co., Montreal, Que.

References: A. T. Hurter, S. Ball, I. Kursbatt, F. W. Boelen, F. M. Krauss.

WADAS—JOSEF FRANCIS, of Montreal, Que. Born at Szopienice, Poland, Oct. 4, 1910. Educ.: Elect. Engr., Federal Institute of Technology, Zurich, Switzerland, 1935; Mech. Engr. Univ. of Dantzig, 1937; Member Assn. Polish Engineers in Canada; 1937-39 asst. to power plant engr., mtce. engr. coal mining machinery, Rybnickie Gwarectwo Weglowe, Poland; 1939-40 dessinateur d'etudes, Societe de Force at Lumiere Electriques, Paris; Defence Industries Ltd., 1941-43, sr. draughtsman, Verdun; 1943-45 chief draughtsman, Villeray; 1945-46 mech. drftsman., Canadian Industries Limited, Montreal; 1946 to date, drftsman. Aluminum Laboratories Ltd., Montreal, Que.

References: N. P. Taylor, J. W. Swift, D. G. Elliot, W. K. Nonnenman, A. L. Martin.

WEBSTER—BRUCE FREDERICK, of Winnipeg, Man. Born at Winnipeg, June 11, 1925. Educ.: B.Sc. (Elect.) Manitoba, 1947; 1947 to date, sales engrg. wire & cable, power app. overhead & underground, Northern Electric Co., Winnipeg, Man.

References: R. A. Marvin, G. H. Herriot, E. P. Fetherstonhaugh, A. E. Macdonald.

WICKWIRE—ROBERT MALCOLM, of Moncton, N.B. Born at Yarmouth, N.S., Oct. 14, 1924. Educ.: B.Eng. (Civil) N.S.T.C., 1947; with Canadian National Railways as follows: 1947-48, instru'man., Campbellton, 1948 to present, instru'man, regional chief engineer's office.

References: H. J. Crudge, J. Pullar, S. Ball, J. W. March, D. S. Wickwire, C. W. Milton, B. N. Cain.

TRANSFER FROM THE CLASS OF JUNIOR

BECKER—HOWARD WARREN, of Edmonton. Born at Springfield, Mo., on March 10, 1911. Educ.: B.A. 1931, B.Sc. (Chem.) Alberta, 1933; R.P.E., Ont. 1933-38, chemical engr. design, operation of gasoline treating plant, Richfield Distrbutors Ltd.; 1938-41, refinery mgr. & chief engr., design, constrn. of 400 Bbl/Day refinery comprising complete distillation facilities, cracking plant, Becker Refineries Ltd.; 1941-42, refinery mgr. & chief engr., Major Refineries Ltd., Turner Valley; 1942-45, R.C.A.F., flying at A.OS. schools; 1945-46, chemical engr., design of lab. test facilities for aircraft, gas turbines, specializing in combustion test facilities, Turbo Research Ltd., Leaside, Ont.; 1946-48, design engr., subsequently chief engr., Standard Chemical Co. Ltd., Leaside; at present, business management & constrn. in family-owned business, viz. Rocky Mountain Bungalow Camps Ltd., Banff & Jasper, Alta. (Jr. 1935)

References: C. A. Meadows, F. C. Richardson, J. Snape.

BINNIE—ROBERT FREDERICK, of Shalalth, B.C. Born at Vancouver on Feb. 3, 1923. Educ.: B.A.Sc. (Civil), B.C., 1945; 1945-46, instru'man., surveys Bridge River Power Devlpt. W. G. Swan, consulting engr.; with Shawinigan Engrg. Co. Ltd., Mtl., as follows: 1946-47, jr. engr. constrn. of diversion dam; 1947 to date, resident engr. on constrn. of Bridge River Power House & appurtenant works, penstocks, tunnels. (St. 1943. Jr. 1947)

References: C. R. Lindsey, J. A. McCrory, R. E. Heartz, V. Dolmage, J. N. Finlayson.

BROWN—WILLIAM BOUGHTON, of Peterborough, Ont. Born at Nova Scotia on Nov. 16, 1910. Educ.: B.Sc. (Elect.) N.S.T.C. 1931; R.P.E., Ont.; 1926-31 general experience on constrn. civil and elect.; with Can. Gen. Elect. Co., Peterboro: 1931-34, students test course; 1934 to date, ast. division engr. Switchgear Eng. Div. (St. 1931. Jr. 1936)

References: E. R. Shirley, B. I. Burgess, G. R. Langley, I. F. McRae, H. R. Sills.

COTE—JOS. LEON, of Quebec. Born at L'Isle, Verte, on March 17, 1913. Educ., B.A., Laval, 1939; Master in Law, Laval, 1948; 1939-41, (6 mos.) distribution station; (6 mos.) generating station; (6 mos.) engrg. dept., draughtsman; (6 mos.) line construction; 1941-45, Major Active Service; 1945-48 with Quebec Power Co. as follows: asst. head of property and tax dept.; at present, lawyer and head of Property and Tax Dept., Quebec. (St. 1940. Jr. 1946). Requests transfer to Affiliate.

References: E. D. Grey-Donald, H. F. Beique, J. St. Jacques, R. Desjardins, R. Rioux, L. Trudel.

CRASTER—JAMES EDMOND, of Montreal. Born at Vernon, B.C., on Feb. 3, 1907. Educ.: B.A.Sc. (Mech.), B.C., 1930; R.P.E., Ont.; 1930-31, mech. graduate student course, Cdn. Gen. Elect. Co.; 1931-34, no engrg. employment; 1934-36, laborer and operator, Consolidated Mining & Smelting Co.; 1936-38, Jr. dftsman., detailer, Cons. M. & S., Trail; 1938-40, dftsman. on hydro elect. constrn., West Kootenay Power & Light Co., South Slocan, B.C.; 1940-42, tech. asst. British Supply Board; 1942-45, inspecting officer, propellants and cartridge div., Inspection Board of the U.K. & C.; with Robert Mitchell Co. as follows: 1945-46, dftsman. and production engr.; 1946-48, production and insptn. engr., (Ekco Products Division); 1949 to date prod. and insptn. Ekco Products Co. (Canada), St. Laurent. (St. 1930. Jr. 1939)

References: G. A. Johnson, B. O. Heron, E. Stiles, E. Mason.

DOKKEN—LORNE ALBERT, of Montreal. Born at Vancouver on May 5, 1920. Educ.: B.Sc. (Agri.) Sask., 1942; R.P.E., Que.; with Imperial Oil Ltd. as follows: 1942-43, design (jr.) Regina; 1943-44, design engr. (jr.), design pumphouses, boilerhouses, refinery, constrn. estimating; 1943-44, metals inspector; 1944-47, plant engr., supervising operations of engrg. design office — metal inspectn. dept. & plant mtce. operations; 1947-48, constrn. engr., constrn. elect. system, substation, pipe line networks; 1948-49, president & gen. mgr., Industrial Mtce. Ltd., Mtl., firm estimates & constructs mech. projects, supplies mtce. service with tradesmen to industrial firms. (Jr. 1946)

References: W. O. Longworthy, J. J. Rowan, T. S. McKechnie, B. P. Rapley, G. P. Dewar, C. W. E. Miles.

FINNIE—NORMAN WILLIAM, of Peterborough. Born at Montreal on Dec. 20, 1912. Educ.: B.Sc. Queen's, 1939; 1935-36, sales office, corresp. quotations, instructn. for switchgear equipt., English Electric Co.; 1936-37, sales office, Packard Electric Co. Ltd.; with Can. Gen. Elect. Co. as follows: 1939-41, test course & departmental plan; 1941-49, designing induction motors, (Integral Polyphase) and Induction Frequency converters in the Induction Motor Engrg. Div. Peterborough. (Jr. 1944)

References: A. R. Jones, F. R. Pope, H. R. Sills, J. P. Watts, G. C. Tollington, R. L. Dobbin, G. R. Langley.

GILLEAN—IAN, of Ottawa. Born at Montreal on Oct. 18, 1913. Educ.: B.Eng. (Elect.) McGill, 1940; 1940 (3 mos.) demonstrator, McGill Univ.; 1941-42, education officer, R.C.A.F.; 1942-45, signals officer; 1945-48, jr. engr. Cdn. Marconi Co.; at present, signals officer, R.C.A.F. (Jr. 1946)

References: L. A. Wright, C. V. Christie, R. DeL. French, W. D. Laird, L. Trudel, A. M. Wright.

HENDERSON—IAN BALFOUR, of Dauphin, Man. Born at Brandon, Man., on Oct. 23, 1921. Educ.: B.Sc. (Civil) Manitoba, 1944; with the Can. National Rlys., Winnipeg, as follows: Summers, 1939, 40, 41, 42, 43, chainman and rodman, 1944, all following at various locations with C.N.; draftsman, i/c field party (May to Dec.); instru'man., i/c field party (Dec. 44-Nov. 45); (Jan.-March) instru'man, i/c relocation party; 1946, dftsman, i/c field party; 1947-48, transitman i/c drafting office; 1948 to date, senior transitman, to Division Engr., C.N.R. (Jr. 1945)

References: J. L. Charles, B. Chappell, R. C. Robinson, R. W. Ross, G. B. Williams, E. P. Fetherstonhaugh, A. E. Macdonald.

HENRIKSON—GUNNTHOR JOHN, of Vancouver, B.C. Born at Selkirk, Man., on Sept. 3, 1913. Educ.: B.Sc. (Elect.), Manitoba, 1936; 1937-42, ast. engr. Distr. Dept. Winnipeg Elec. Co.; 1942-45, Electrical Lieut. R.C.N.V.R.; 1945 to date, distribution engr., supervising the planning of electrical distribution in district No. 2, B.C. Elec. Ry. Co. Ltd., Vancouver. (Jr. 1937)

References: E. V. Caton, S. H. deJong, J. P. Fraser, E. P. Fetherstonhaugh, N. M. Hall.

HOAR—CHARLES RICHARD, of Calgary, Alta. Born at Lydford, England, on Dec. 25, 1917. Educ.: B.Sc. (Elec.) Alberta, 1940; 1940-41, jr. engr. Calgary Power Co. Ltd.; 1941-43, chief engr. inspector, British Comm. Air Training Plan; with R.C.A.F. as follows: 1943-44, O/C A.I. Detachment and No. 16 A.I. District; 1944-45, elect. mtce. officer, Boundary Bay (Liberator & Mitchel Aircraft); 1945-48, distribution and transmission engr., mtce. of electrical transmission lines and distribution systems, design, Calgary Power Ltd. (St. 1940. Jr. 1943)

References: H. B. LeBourveau, J. N. Ford, H. A. Ripley, D. C. Hutchison, L. A. Thorssen, R. C. Peck, F. T. Gale.

JARRY—AUREL G., of Montreal. Born at Montreal on Jan. 11, 1916. Educ.: B.Eng. (Civil) McGill, 1940; R.P.E., Que.; summer 1939, Quebec Highways; 1940-43, navigation instructor, R.C.A.F.; 1944-45, overseas, Pathfinder Navigator; 1945-46, servicing and maintenance of automobiles and tractors; 1947 to date, coproprietor, service mgr. and industrial div. mgr., Jarry & Frere Ltd. (St. 1940. Jr. 1943)

References: M. Langlois, E. R. Hammond, C. O. Monat, L. Nadeau, F. P. Valiquette.

KENST—RICHARD JOHN, of Victoria, B.C. Born at Sask. on Dec. 25, 1915. Educ.: B.Eng. (Elect.), McGill, 1939; summers, 1936, electrician, Atlas Coal Mine, East Coulee, Alta.; 1937, construction-building, Sask.; 1938, operator, Mtl. Light, Heat, Power, Cedars, Que.; 1939, electrical mtce. International Nickel Co. of Canada, Copper Cliff, Ont.; 1940-41, Imperial Oil Co., geo. physical surveys in Western Canada; operator and computor—oil surveys, Tropical Oil Co., Bogota, Columbia, S.A., 1943-45, Northern Electric Co., Mtl., manufacturing methods engr., production; 1945-48, owner and mgr., automotive business, Vancouver, B.C.; at present, industrial Power and commercial sales representative, British Columbia Electric Co., Victoria, B.C. (St. 1939. Jr. 1946)

References: S. H. Frame, K. Reid.

L'HEUREUX—LEON JOSEPH JEAN, of Baltimore, U.S.A. Born at Gravelbourg, Sask., on March 2, 1919. Educ.: B.S. (Engrg. Phys.), Sask., 1944; M.A. Johns Hopkins Univ., Baltimore, 1948; summer 1942; jr. engr., Alaska Highway employed by U.S. Public Roads Administration; 1943-44, instructor, Univ. of Sask.; 1944-47, Officer, Canadian Army, work consisted in radio and line communication; at present, studying at Johns Hopkins Univ., to obtain Doctor's Degree in elect. engrg., June, 1949. (St. 1943. Jr. 1946)

References: N. B. Hutcheon, I. M. Fraser, W. E. Lovell, A. G. Christie, E. K. Phillips, R. A. Spencer, G. M. Williams.

MANUEL—OLIVER HEMPHILL, of Lunenburg, N.S. Born at Florenceville, N.B., on Oct. 20, 1918. Educ.: B.Sc. (C.E.), N.B., 1940; R.P.E., N.B., summers, 1937-38-39, surveying asst. Fed. Dept. of Public Works; 1940, surveying asst. Town of Truro, N.S.; 1940-42, estimator, dftsman., Imperial Oil Refinery, N.S.; with the R.C.N.V.R. as follows: 1942-44, Mtce. Officer, ranks of Sub. Lieut. and Lieut. at the following naval shore establishments, Bedford Magazine; 1944-45, Bedford Magazine & R.C.N. Armament Dept. of Dartmount, N.S.; 1945, H.M.C.S. Peregrine; 1945-46, H.M.C.S. Stadacona; 1946, appraiser of property, damage from Bedford Magazine explosion; (one mo.) surveyor, Renous Naval Magazine Naval Service; 1946-47, engr., Public Works of Canada; 1947-48, town mgr.; 1949, town engr. Town of Lunenburg, N.S. (St. 1940. Jr. 1944)

References: K. E. Bentley, G. M. Brown, P. F. Beaudry, R. Mulcahy, J. M. Redding.

RICHER—JEAN HERBERT, of Hampstead, Que. Born at Montreal on March 24, 1918. Educ.: B.Eng. (Mech.), McGill, 1943; R.P.E., Que.; 1941, radio technician, C.B.C. Radio Station, Ottawa; 1942, general machine shop and paper mill, Howard Smith Paper Mills, Beauharnois; with R.C.N.; 1943, asst. to chief engr. on H.M.S. Whimbul, H.M.S. Rother, H.M.S. Vansittart; 1944, chief engr., H.M.C.S. Grandmere; H.M.C.S. St. Piere; 1945, asst. to officer i/c at Halifax of demobilization of R.C.N. engineering officers; 1946, asst. master mechanic, Quebec North Shore Co. paper mill, Baie Comeau; at present, engr. special studies attached to the executive at the Montreal Tramways Co. (Jr. 1946)

References D. E. Blair, A. Benoit, J. Archambault, A. Duperron, E. Gohier, E. Nenniger, W. R. Simmons.

SCHOFIELD—STEWART MacLEOD, of Port Coquitlam, B.C. Born at Winnipeg on Oct. 15, 1920. Educ.: B.Sc. (Civil), Manitoba, 1942; summers with Manitoba Good Roads Board, 1938, rodman on highway work; 1939, checker; 1940, rodman, C.P.R., Kenora, Ont.; 1941, dftsman. (part time), Dept. of Munitions & Supply, Winnipeg, Man.; 1942, instru'man, general mtce. work, Hudson Bay Railway; The Pas, Man.; 1942-45, Lieut. R.C.E., England and Europe; with Dept. of Public Works, Essondale, B.C., 1945-46, resident engr.; at present, resident engr. and asst. supt. of works. (St. 1941. Jr. 1946)

References: V. C. Hamilton, K. Moodie, A. E. MacDonald, H. L. Main.

SEYMOUR—DAVID LLEWELLYN, of Ottawa. Born at Aylmer, Que., on March 1, 1918. Educ.: B.Sc. (Civil), Queen's, 1942; R.P.E., Ont.; summers, 1940, rodman, Airport Survey, Dept. of Transport, Jarvis, Ont.; 1941, student engr. H.E.P.C. of Ont.; 1942-45, Lieut. R.C.E. Cdn. Active Army; 1945-47, part time demonstrator, Faculty of Science, Queens Univ.; 1947-48, asst. city engr. Corporation of the City of Peterborough; at present, engr. grade 3 civil engrg. and constrn. division, Lands and Development Services Branch, Dept. of Mines & Resources. (St. 1941. Jr. 1946)

References: D. S. Ellis, J. D. Lee, R. A. Low, T. S. Mills, J. N. Stinson, R. A. Campbell.

SILVERBERG—DAVID M., of Winnipeg, Man. Born at Winnipeg on April 21, 1913. Educ.: B.Sc. (Elect.), Manitoba, 1936, with Dept. of Transport as follows: 1940-48, engrg. dftsman.; 1948-49, engr., civil aviation division, District Airway Engineer's Office (Winnipeg. (St. 1938. Jr. 1943)

References: W. E. Fenn, D. N. Sharpe, O. Marantz, E. P. Fetherstonhaugh, S. M. Carrick, G. H. Herriot.

SKERRY—FRANCIS STEPHEN, of Halifax. Born at Waverley on Dec. 16, 1912. Educ.: B.Eng. (Elec.), Nova Scotia Technical College, 1935; 1936-38, inspector, N.S. highways, Milton Hersey Co.; with English Electric Co. as follows: 1938-41, diagram and circuit dftsman., Stafford, England; 1941-47, circuit breaker engr., responsible for installation, some remedial design of air blast circuit breakers, England; at present, engr. grade 3, Naval Service, responsible for mtce., installn. of electrical equipment, Shore Establishment East Coast. (Jr. 1938)

References W. E. Smith, A. R. Harrington, J. L. Ryan, G. H. Burchill, E. C. O'Leary.

SMITH—CLAUDE HARRY M., of Trenton, Ont. Born at Peterborough on Aug. 17, 1920. Educ.: B.A.Sc. (Civil), Toronto, 1943; R.P.E., Ont.; summers, rodman, Dept. of Transport; 1941, design dftsman., Gen. Motors of Can.; 1942, instru'man, Labrador and Peace River), Dept. of Mines & Resources; 1943-46, Lieut. R.C.E. and Infantry; 1946, highways engr. Dept. of Highways; 1946, jr. design, E. R. Cross, Toronto; 1946-47, estimator, C.N.R. Dept. Engrg. of Construction; 1947-48, design (structural), C.N.R. Bridge Dept.; at present, plate shop supt. and welding engr., Central Bridge Co., Trenton. (St. 1943. Jr. 1946)

References: W. B. Redman, H. E. Archibald, R. F. Legget, B. R. Perry, E. A. Cross.

SMITH—GERALD McRAE, of Sudbury, Ont. Born at Edmonton on June 23, 1909. Educ.: B.Sc. (Chem.), Alberta, 1935; with International Nickel Co. of Canada, Copper Cliff, Ont., steady since Dec., 1935; at present and for the past five years in charge of stope and development work of the Frood Mine. (St. 1935. Jr. 1946)

References: M. S. Stewart, F. J. DeStefano, G. Benjafield, I. F. Morrison, R. M. Hardy.

TANT—VERNE EVERET, of Carleton, Ont. Born at Sask., on Oct. 15, 1920. Educ.: B.Sc. (Elect.), Manitoba, 1944; R.P.E., Ont.; summers, 1942, electrician repair and mtce. of electric motors, installation of production machinery, lighting, Ford Motor Co.; 1943, design, layout of equip. mountings, checking design of high pressure equipt., Cdn. Ingersoll Rand; 1944-45, elect. engr. Dept. of Munitions and Supply; 1945-46, chief, specifications section, National Research Council; 1946 to date, chainman, specif. panel of the electronic standards sub committee, i/c preparation on joint Cdn. service standard specifications on electronic components and materials, Dept. of National Defence for Air. (St. 1944. Jr. 1946)

References: F. E. Hanrahan, M. Smith, F. L. G. Askwith, E. P. Fetherstonhaugh.

TEMPLE—PAUL BLAKE, of Cleveland, Ohio. Born at Toronto on May 17, 1924. Educ.: B.A.Sc. (Civil), Toronto, 1946; R.P.E., Ont.; summers, with Dept. of Highways, 1943, constrn. inspector; 1944, instrument man; 1945, instru'man., Dominion Dept. Mines & Resources; 1946, (4 mos.) supervising Auger boring at Beardmore Leather Co., Acton, Ont., temporary work under Prof. R. F. Legget, M.E.I.C.; 1946, reinforced concrete and structural steel designer, C. D. Howe Co., Hamilton; 1946-48, asst. resident engr. on grain elevator constrn. C. D. Howe Co.; 1947-48, night school teacher, architectural draughting, Northern Vocational School, Toronto, Ont.; 1948 to date, reinforced concrete designer, on rigid frame structures, A. G. McKee & Co., Consulting Engrs., Cleveland, Ohio. (St. 1946. Jr. 1948)

References: C. R. Young, R. F. Legget, C. F. Morrison, M. W. Huggins, O. Holden, G. W. Wallace, W. M. Treadgold.

ULOTH—MILTON MacRITCHIE, of Peterborough, Ont. Born at New Harbor, N.S. Educ.: B.Eng. (Elec.), Nova Scotia Tech. Col., 1942; R.P.E., Ont.; summer, with Cdn. Gen. Electric as follows 1942, test course; 1943-44, engr., small motors eng. div.; 1944-46, Lieut. elect. branch, Naval Service Hdqts., expediting and inspection of electrical apparatus for R.C.N. in Montreal area; returned C.G.E.; 1946-48, engr. small motors eng. div.; 1948 to date, engr. motor and generator eng. div. (Jr. 1943)

References: G. R. Langley, V. S. Foster, A. L. Dickieson, H. R. Sills, B. Ottewell.

WELDON—GEORGE HORACE, of Winnipeg. Born at Winnipeg on June 7, 1914. Educ.: B.Sc. (Elect.), Manitoba, 1936; 1937-38, miscellaneous, construction duties, Power Corp. of Can.; 1938-39, electrician, Lake Shore Mines; 1939-40, electrician, International Nickel Co.; 1940-45, supervisor, Defence Industries Ltd.; 1946 to date, farm electrification engr., Manitoba Power Commission. (St. 1937. Jr. 1943)

References: T. L. Woodhall, J. W. Tomlinson, E. P. Fetherstonhaugh, G. M. Moule, H. L. Mahaffy.

WINN—JAMES, of Quebec. Born at Leeds, England, on April 21, 1912. Educ.: B.Eng. (Mech.), McGill, 1935; with Anglo Pulp Co. as follows: 1935-36, heating and vent.; 1936-40, flow meters; 1940-45, Royal Cdn. Engineers; 1945 to date, plant engr. Anglo Cdn. Pulp and Paper Mills Ltd. (St. 1935. Jr. 1946)

References: J. O'Halloran, R. J. Chambers, R. H. Farnsworth, E. D. Gray-Donald, R. Desjardins.

TRANSFERS FROM THE CLASS OF STUDENT

HEFFERNAN—JOSEPH JAMES, of Brandon, Man. Born at Windsor, Ont., on May 20, 1922. Educ.: B.A.Sc. (Mech.), Toronto, 1948; summers, 1940-41-42-43, sheet metal worker, machine hand, dftsman., apprentice machinist, Gotfredson Ltd., Windsor, Ont.; 1945, Motor Transport instructor RCE-CADRE 5th Can. Div. Ft. Belvoir, Va., U.S.A.; 1946. Officer i/c airportability section, No. 1 Airborn Research & Developt. Centre, Camp Shilo, Man.; 1946-47, Officer i/c army experimental aircraft loading trials—Joint Air School, Shilo and Rivers, Man., at present engrg. advisor to chief experimental officer, Army Component, Joint Air School, Rivers, Man. (St. 1948)

References: E. A. Allcut, G. R. Lord, C. R. Boehm, C. R. Young

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required by Pulp and Paper Mill in Quebec. Previous experience in the industry preferable but not essential. Salary open. Apply to File No. 1170-V.

CIVIL

GRADUATE CIVIL ENGINEER with some experience in structural steel required by firm engaged in the manufacture and sale of prefabricated steel structures. One man needed for liaison and co-ordinating the work between fabricators and design engineers and one for visiting clients in Quebec, with headquarters in Toronto. Salary depends on ability and experience with a minimum of $350.00. Apply to File No. 1168-V.

CIVIL ENGINEER, preferably bilingual required by well established firm of Engineers and Contractors located in Montreal. Applicant should have about five to ten years experience in engineering construction and estimation. Salary open. Apply to File No. 1174-V.

MECHANICAL

MECHANICAL ENGINEERS with 3-5 years experience in mechanical design and general plant engineering, as well as field work required by firm in Quebec. Salary open. Apply to File No. 1001-V.

GRADUATE ENGINEER, preferably with mechanical background and sales experience required by large well known firm as Representative for a Distributor of pneumatic material-handling equipment. Principal contacts will be in cement, heavy chemical, food, pulp and paper, brewing and aluminum industries. Salary open. Apply to File No. 1158-V.

MECHANICAL ENGINEER required to take over complete operations of machine shop, foundry and pattern shop in Province of Quebec. Must be bilingual. Salary open. Apply to File No. 1169-V.

SENIOR MECHANICAL DRAUGHTSMAN, thoroughly experienced in machine design with some background and knowledge of material handling equipment. Salary open. Apply to File No. 1171-V.

MINING

MINING ENGINEERS for design and layout work also some field work required by firm in Province of Quebec. Salary open. Apply to File No. 1001-V.

MISCELLANEOUS

MECHANICAL OR ELECTRICAL ENGINEER required as assistant to mechanical superintendent in large eastern Canadian brewery. Duties will include assisting supervision of maintenance and installation of pumps, motors, steam boilers and refrigeration system, etc. This is a junior position, so no experience is required. Salary open. Apply to File No. 1154-V.

SENIOR TOOL DESIGNERS required in Toronto. Should have not less than ten years experience in general tool designing in addition to a basic training of three to five years at tool and jig making. Experience in tooling for the automotive or aero-engine production industry an asset. Salary open. Apply to File No. 1160-V.

PROFESSOR AND CHAIRMAN of the Dept. of Electrical Engineering required by University of Manitoba. Position becomes vacant September 1st, 1949. Salary will depend on candidates qualifications. Apply to File No. 1162-V.

GRADUATE ENGINEER required for a new plant being built in the Maritimes. Duties include installation of machinery also operation of plant. Applicant should have general engineering experience knowledge of steam, electricity and a certain amount of chemistry training, although the latter is not essential. He could be trained in this part after the plant operates. Salary open. Apply to File No. 1163-V.

CHIEF DESIGN ENGINEER, capable of taking care of and being responsible for all drawing office work in a modern West Coast pulp and paper mill. Applicant must have a minimum of five years responsible design practice in pulp and paper work. Salary open. Apply to File No. 1164-V.

SALES ENGINEER, mechanical background required in Montreal. Must have knowledge of heating, ventilating and pumps. Salary open. Apply to File No. 1165-V.

RECENT GRADUATE required, familiar with or interested in design and testing of centrifugal reciprocating power and direct acting steam pump of all types. Position located in Ontario. Salary open. Apply to File No. 1166-V.

GRADUATE ENGINEER preferably electrical or mechanical background required by large industrial plant as maintenance engineer. Duties include responsibilties of all maintenance work also setting up and maintaining lubrication and inspection schedules. Salary open. Apply to File No. 1167-V.

SALES ENGINEER required for the Montreal district to represent a reputable conveyor company manufacturing in the Province of Ontario. Conveyor experience is desirable but not strictly necessary but engineering background essential. Remuneration would be on a commission basis with excellent possibilities. Apply to File No. 1172-V.

TWO experienced bilingual men required for approximately 18 months work in French Morocco under excellent conditions. One with structural design, field and instrument experience and one with adequate practical experience and capacity for Construction foreman opening. Salaries $350 to $550 per month. Apply to File No. 1175-V.

MECHANICAL SALES ENGINEER, age 30 to 40 years with executive ability required by old-established firm in Montreal. Good opportunity for an aggressive salesman to expand the present contacts and to create new fields. Knowledge of French an asset. Salary open. Apply to File No. 1176-V.

The following advertisements are reprinted from last month's Journal, having not yet been filled.

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST recent Ph.D. or equivalent with good background in organic chemistry preferable along the lines of wood and cellulose chemistry and fuels technology. Applicant needs capacity for contacting plant personnel and appreciation of engineering phases of problems. Position in British Columbia. Salary open. Apply to File No. 1118-V.

CHEMICAL ENGINEER recent graduate, required for position in technical department of a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 1122-V.

CHEMICAL ENGINEER required as plant chemist by large newsprint mill. Preferably four to six years in the pulp and paper industry in chemical and control departments. Salary open. Apply to File No. 1131-V.

CIVIL

CIVIL ENGINEERS, required by public utility in Toronto. Must have at least five years experience in design of steel structure on power developments. Salary open. Apply to File No. 1109-V.

CIVIL ENGINEER with a least 2 years practical experience required by a large inter-municipal Corporation in Western Canada. Under supervision and direction applicant must be able to assist and perform technical engineering work, prepare plans, perform field duties in connection with the construction and maintenance of simple structures, to install equipment, supervise and direct small groups of men. Salary $235 up. Apply to File No. 1144-V.

CIVIL ENGINEER, 25 to 30 years of age, preferably veteran with some experience in construction field. Duties and future would lie in supervision and later some administration. Position offers long term security, pension, etc., and reasonable advancement with merit. Salary open. Apply to File No. 1149-V.

JUNIOR CIVIL ENGINEER preferably with some experience in construction work required in Alberta by company starting the construction of a new hospital. Salary open. Apply to File No. 1152-V.

ELECTRICAL

ELECTRICAL ENGINEERS required by public utility in Toronto. Must be experienced in communications preferably a specialist in radio and frequency modulation, also knowledge of power and telephone line carriers required. Salary open. Apply to File 1109-V.

ELECTRICAL ENGINEERS, experienced in the maintenance of power meters and relay protection schemes, also men experienced in installation of large rotating electrical machines, high voltage and low voltage switch gear. Manufactures test, experience preferred. Positions with public utility in Toronto. Salaries open. Apply to File No. 1109-V.

ELECTRICAL ENGINEERS required by public utility in Toronto. Must have the following experience: Design layout and estimates for medium and large, low voltage and high voltage substations or design and construction of transmission and distribution lines. Salary open. Apply to File No. 1109-V.

ELECTRICAL ENGINEER for sale of electrical and allied machinery in Southern Alberta to open branch office in Calgary. Must have trade contacts and interests in firm can be purchased by a proven suitable man. Apply to File No. 1123-V.

SENIOR ELECTRICAL DRAUGHTSMAN required in Toronto. Must have considerable experience on generating and substation layouts. Salary open. Apply to File No. 1137-V.

ELECTRICAL ENGINEER required by city in Western Canada. Duties will primarily be concerned with designing of all new electrical work for any city department also inspecting and checking existing installations. Work will be under the supervision of the Superintendent and the Assistant Superintendent. Salary $250 to $300 per month. Apply to File No. 1143-V.

GRADUATE COMMUNICATION ENGINEERS, Canadian citizens, interested in audio, radio and video frequency systems engineering. Salaries up to $350 per month depending on qualifications, location Montreal. Apply to File No. 1147-V.

ELECTRICAL ENGINEER, who could be responsible for operation and maintenance of electricity, air conditioning and instrument systems for large, modern industrial plant in Eastern Ontario. Electrical trades experience is essential but training would be provided on air conditioning and instrument work. Apply to File No. 1155-V.

MECHANICAL

MECHANICAL ENGINEER, required as Service Promotion Man for Export Division of large National Organization. Must have good technical background and service experience in the automotive industry. Responsibilities include writing and editing promotion material, policies, bulletins and effective letters. Salary open. Apply to File No. 1110-V.

MECHANICAL ENGINEER recent graduate required as sale Engineer by a firm of Power House and Dust Collection Specialties. Job located in Ontario and training period in Montreal. Salary $250. Apply to File No. 1126-V.

METALLURGICAL

METALLURGICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in research, development and production. Salary open. Apply to File No. 1106-V.

MISCELLANEOUS

COMBUSTION ENGINEER, wanted by large industry near Montreal. Must be capable of taking charge of high pressure boilers, turbo generators and boiler house personnel. Permanent position and good salary. Apply to File No. 1105-V.

GRADUATE ENGINEERS interested in applied research in inorganic physical chemistry required for research laboratory of Montreal firm. Applicants should have from two to five years experience. Salary open. Apply to File No. 1107-V.

ELECTRICAL OR MECHANICAL ENGINEERS, with experience in electrical, industrial and commercial equipment and domestic appliances for frequency conversion program. Position with public utility in Toronto. Salary open. Apply to File No. 1109-V.

GRADUATE ENGINEER, preferably with 6 to 10 years postgraduate experience to act as field representative of Technical Information Service, N.R.C. in Toronto. As the work involves personal visits to industrial firms personally-owned car is essential. Apply to File No. 1115-V.

GENERAL MANAGER required for Saskatchewan Power Commission. Position requires full responsibility and authority for all operations. Principal requirements, administrative, engineering or other technical experience in power operation very desirable. Salary open. Apply to File No. 1117-V.

ASSISTANT CITY ENGINEER required for city of Calgary, Alberta. Applicant must have executive ability and preferably experience in Municipal work covering sewers, sewage disposal, streets, paving, sidewalks, bridges, building construction and town planning. Salary range $3,500 to $4,500. Apply to File No. 1125-V.

CIVIL OR MECHANICAL ENGINEERS required for openings in connection with construction of new refinery being built at Montreal East, preferably some experience in heavy chemical industry, also junior vacancies. Salaries open. Apply to File No. 1128-V.

JUNIOR SALES ENGINEER, preferably mechanical background, required in Montreal by large industrial firm. Preferably with a couple of years experience and the desire to get into sales work. Salary $250. Apply to File No. 1130-V.

JUNIOR ENGINEER required by American Company for their three factories located in Canada. Duties include supervision of office routine order supplies, etc. Knowledge of French and English would be an advantage. Salary open. Apply to File No. 1132-V.

DRAUGHTSMAN with five to ten years' experience in plant layout material handling equipment and some structural required by an electro-metallurgical plant located in Northern Ontario city. Salary open. Apply to File No. 1139-V.

MANAGER OF MANUFACTURING required by Canadian mill producing 600 tons per day of specialty papers, tissues, paperboard and newsprint. Position requires proven managerial ability and technical qualifications for the production of paper. Location most desirable and salary attractive. Apply to File No. 1140-V.

DESIGNING AND STRUCTURAL ENGINEERS required by Provincial Government West Coast. Duties include designing and preparation of plans of bridges, ferries, wharf structures, etc., in timber, steel or concrete. Preferably with experience in bridge design and construction. Salary $3,504 rising to $4,104 per annum. Apply to File No. 1142-V.

CIVIL OR SANITARY ENGINEER, with a number of years experience required by a large inter-municipal Corporation in Western Canada. Must be able to assume responsibility in design, detailing, estimating, preparing specifications, to layout and supervise the construction repairs and maintenance of a sewerage collection system and treatment plant. Salary $325 per month up. Apply to File No. 1144-V.

SUPERINTENDING ENGINEER for Eastern University to take charge of physical plant maintenance and help plan the building program. Salary from $350. Apply to File No. 1145-V.

SALES ENGINEERS required by control equipment manufacturer, one man needed for industrial sales and one with background in heating and ventilating. Headquarters in Montreal. Salaries open. Apply to File No. 1146-V.

TOWN ENGINEER required by town in Ontario. Duties include supervision of Board of Works as well as complete charge of municipal, electrical water and telephone department projects. Salary open. Apply to File No. 1150-V.

CHIEF ENGINEER required by large public utility system in Eastern Ontario. Applicants must have had experience in the operation and design of electric or waterworks systems. Salary open. Apply to File No. 1151-V.

ASSOCIATE PROFESSOR in organic Chemistry and fuels Technology. Duties will be to teach a first course in Organic Chemistry to junior students, a course in Organic Unit Processes in the senior year, and such other work as may be assigned. Special emphasis will be given to Chemical Utilizations of Solid and Liquid Fuels, including gasification, hydrogenation, etc. Apply to File No. 1156-V.

ASSISTANT PROFESSOR of Mineral Engineering. Duties will be to instruct in Mineralogy and Mineral Dressing with special reference to coal and the industrial minerals, and they will include operation of the mineral dressing laboratories for commercial testing of ores and processes. Apply to File No. 1156-V.

DRAUGHTSMEN, required by G.E.G. Switchgear Department, Engineering Works, Witton, Birmingham, 6, England. Must have good experience in any class of switchgear design or layout. Permanency and good opportunities for capable men. Apply, stating age, experience and technical qualifications to File No. 1157-V.

AERODYNAMICIST capable of carrying out performance and stability calculations for initial design. Permanent position with good prospects, in Montreal area. Salary open. Apply to File No. 1159-V.

Partner Wanted

ACTIVE PARTNERSHIP desired with a firm of General Building Contractors located in Montreal or would be interested in forming new company with one or more construction engineers. Advertiser has capital and 20 years of construction experience. For additional information. Apply in confidence to File No. 2138-W.

PARTNER, wanted by engineer with 25 years experience, contemplating private practice. Must have necessary qualifications; previous experience with consulting engineer desirable. Apply to File No. 2642-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., age 33, 11 years engineering experience in mining, all types surveying, airport and highway construction, building construction, sewage and water works office administration and mechanical experience in pulp and paper industry for past 3 years. Would like to contact parties or company interested in consulting engineering or construction with view to partnership, junior or otherwise. Wanted location in west, preferably Edmonton. Apply to File No. 2792-W.

Situations Wanted

MECHANICAL GRADUATE, M.E.I.C., University of Toronto, Canadian citizen, experience in Canada and abroad, knowledge of several languages. Desires contacts in view of changing the actual line of work with better salary. 37 years old, married with small family. Great practical and theoretical knowledge in Thermodynamics, Hydraulics, Aircraft and Furniture making and Finishing also all systems of Production Control. Minimum salary accepted $7,000 a year Apply to File No. 140-W.

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Queen's, age 49. 5 years hydro-electric power development construction, 1 year industrial building construction, 2 years sales engineer and estimator architectural iron works concern, 14 years oil refinery on initial construction, on operations and maintenance, last 6 years refinery engineer in charge of maintenance, safety, equipment inspection, design and construction of plant changes and extensions.

Engineering Publicity

Wanted for large Mantreol engineering cancern, assistant to Sales Development Manager far wark an baoklets, advertisements, editarial articles, etc. Some engineering background is essential. Experience in writing or publicity is desirable. This is a positian offering interesting work, good prospects and gaad salary far the right man. File No. 1178-V.

industrial buildings. Resigned to undertake private venture. Desires to re-enter industry. Apply to File No. 166-W.

MECHANICAL AND ELECTRICAL, M.E.I.C., P.ENG. (Ont.). Age 41. Single. Overseas 1940 with R.C.E., followed by 7 years as Technical Staff Officer, British Army, on Research and Development, including period as Head of Technical Intelligence Mission to Austria. Vickers Plant Course followed by 13 years Canadian experience including Telephone Plant; Automobile; Electrical Power Apparatus and Wire and Cable; Design and Manufacture Electric Cranes, Foundry Equipment Diesel Engines and other Heavy Engineering Products. Intimate knowledge British Ministry of Supply and Engineering Industry, Pre- and Post-War knowledge of all Europe, particularly Belgium, Switzerland, Austria and Czech-Slovakia. Interested in European position for Canadian or U.S. firm or Administrative Engineering Post in Canada. Apply to File No. 415-W.

MECHANICAL ENGINEER, age 39, experienced in tool design and production methods, material selection, production records, control and co-ordination. Desires employment preferably in Montreal with either manufacturer or firm of Engineers who could utilize all or a part of above experience. Apply to File No. 551-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Sc. (E.E.) Manitoba 1943. Age 27. Married. Electrical experience with R.C. Signals and 2½ years general electrical experience in industry. Sales training. Presently employed but desires position offering wider scope and opportunity. Preferably Montreal area. Apply to File No. 925-W.

PRODUCTION ENGINEER, M.E.I.C., P. ENG., McGill '33 (Electrical). Married. Extensive knowledge business organization and management. Accustomed to conferring with top Executives. Broad experience includes sales, plant organization and management, interpretation and use financial reports and plant operating statements, budgetary control, production plannings, cost development and control, method improvements, plant layout and general engineering. Desires permanent association, offering good future possibilities, with well established manufacturing or sales organization. Available on reasonable notice. Apply to File No. 1186-W.

MINING GRADATE, M.E.I.C., with 20 years experience in mine operation and development, and associated construction etc., desires permanent connection with senior responsibility; Ontario location preferred. Apply to File No. 1252-W.

MECHANICAL ENGINEER, M.E.I.C., McGill 1940. Age 33. Married. Experienced in plant and canal construction; shop work and shop management, cost estimating and control, aircraft maintenance and design. Previous positions include company chief inspector and assistant superintendent. Seeking responsible position in Montreal area. Available three weeks' notice. Apply to File No. 1586-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill, 1943, age 28, married with small family. Practical experience in machine shop, draughting, assembly and tool room work. 2½ years Engineer Officer Royal Canadian Navy, operation and maintenance of marine engines and auxiliaries. 3½ years production engineering, plant layout, manufacturing methods, etc. Knowledge of cost accounting and industrial management. Desires position in production, sales or maintenance. Available on short notice. Apply to File No. 1592-W.

CIVIL ENGINEER, M.E.I.C., age 41, interested in position as Project Manager or Chief Engineer. Sixteen years of experience in field and office covering design and construction of large building projects, surveys, bridges, roads, dams, and particularly Hydro Electric power projects. Capable of taking complete charge of design and construction. Apply to File No. 1751-W.

INDUSTRIAL AND CIVIL ENGINEER, M.E.I.C., P.Eng., Que. B.A.Sc. Age 40. Married. Fluently bilingual. Seeks position as Industrial Engineer, Executive Sales Engineer, Town Engineer, experience in motion and time study, methods, process, development, production control, costing, plant maintenance, highway engineering, municipal engineering, sales. Available on short notice. Apply to File No. 2157-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., University of Sask. 1940, age 32, married. Continuous employment in engineering field since graduation. Experience includes design office and field work on construction, structural and mechanical plant engineering, maintenance and project engineering, production control, cost estimating and control. Seeking responsible position with future, preferably in Montreal area (Home). Available shortly. Apply to File 2219-W.

GRADUATE ENGINEER, M.E.I.C., McGill Chemical engineering 1935. Six years experience in plant operation, four years in the R.C.A.F., aeronautical engineering and four years in business and industrial consulting. Desire responsible position in Quebec or Ontario. Apply to File No. 2228-W.

MECHANICAL INDUSTRIAL ENGINEER, Jr.E.I.C., leaving for Europe in near future. Will undertake missions of technical or other nature. Research, executive, service or sales works. Bilingual, age 27, good appearance, broad experience. Apply to File No. 2338-W.

CIVIL ENGINEER, M.E.I.C., '33, D.L.S., railway, mining, government and construction experience. Not averse to some travelling. Opportunity to advance lacking in present position. Married. Age 37. Available one month's notice. Full details of qualifications on application. Apply to File No. 2460-W.

INDUSTRIAL-MECHANICAL ENGINEER, Jr.E.I.C., P.Eng. Ont., B.A.Sc. Married. Age 29. Desires position requiring more responsibility and initiative in paper, lumber or allied industry or consulting industrial firm preferably on west coast or southern Ontario. Officer veteran. Experience in production control, cost analyses, plant and production layouts, work simplification, material handling, motion and time study, incentive systems. Now completing Business methods course. Apply to File No. 2794-W.

GRADUATE CIVIL ENGINEER, M.E.I.C., P.E.Q., with seven years intensive work with large pulp and paper mill, construction, maintenance, estimate, layouts, process development, time study, etc., also experience in public work-management; water, sewer, electric system generation, transmission and distribution with full responsibilities of design and work, etc. Services available at short notice. Age 32. Married and bilingual. Apply to File No. 2823-W.

CHEMICAL - METALLURGICAL ENGINEER, M.E.I.C., McGill. Age 43. Eighteen years experience in process development and operation, covering ore beneficiation (metallic and non-metallic), ferrous metallurgy, inorganic chemical processing. Positions held largely management. Familiar with determining suitable plant location and layout, equipment design and specification, process simplification, control and operation. Desires connection with progressive firm as manager of promising venture. Presently engaged. Minimum salary $6,000. Apply to File No. 2831-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44. 7 years industrial experience. Welding application and metallurgy, production supervision, production specifications, purchasing, wage incentives, time study, estimating, costing, design. Available 4 weeks notice. Apply to File No. 2920-W.

GRADUATE MECHANICAL ENGINEER, A.M.I.M.E., fully qualified, age 34, educated on the continent and in England with extensive experience in layout, design and manufacture of handling machinery requires post with expanding organization. Available shortly. Apply to File No. 3021-W.

RESEARCH PROBLEM WANTED: Three students working for degree of Master of Chemical Engineering who will be working in Montreal this summer on experimental portions of their thesis desire an additional problem in Applied Unit Operations to be completed on a co-operative basis to help finance studies. Apply to File No. 3049-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng.Q., G.I., Mechanical E., A.M.I. Loco., E., (Great Britain). Aged 30. Married. 6 years locomotive design and construction, machine shop production and assembly. 5½ years Engineer Officer, Royal Air Force—rank Squadron Leader, Chief Technical Officer. Employed 2 years in Province of Quebec. Desires change to position with more responsibility and opportunity for advancement. Preferably Southern Ontario and Western Canada. Apply to File No. 3059-W.

SALES ENGINEER, M.E.I.C., retired Naval Officer. Mechanical and electrical background. Experienced in sales and running branch office. Four years with wartime shipbuilding, 2 years with War Assets Corporation in technical and executive capacity. At present in marine and engineering supply sales. Interested in permanent position in Montreal area. Apply to File No. 3081-W.

CIVIL ENGINEER, S.E.I.C., E.I.T. (B.Sc. Alta.), age 29. Married. Presently employed in construction supervision design and estimating. Experienced in highway and municipal works, surveys and layout. Four and one-half years overseas artillery survey experience. Desires a permanent position with a consultant or other engineering firm in Western Canada. No objection to travel in connection with field work. Available on reasonable notice to present employer. Apply to File No. 3106-W.

MECHANICAL ENGINEER, M.E.I.C., age 35, married, excellent health. Four years practical mining experience, three years woods operations. Presently employed in woods mechanization program. Three years army experience, automotive repair and maintenance. Desires work in maintenance, or sales and supervision of field installations, testing and making estimates. Apply to File No. 3115-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Eng., (McGill) 1944. Married, 26 years of age, one child. Army service in R.C. Signals. Post-graduate training in Radio Physics at the University of Western Ontario. At present employed as Assistant Professor of Physics at a Maritime University. Interested in research or development in radio, electronics or allied fields. Preferably Montreal or Ottawa area. Apply to File No. 3127-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., Toronto, veteran, age 27, married, graduating this spring, desires employment commencing about May 1st. Will consider anything, but primarily interested in reinforced concrete and structural steel design work in Southern Ontario. Apply to File No. 3128-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., graduating in May, 1949, from University of British Columbia. Age 23, married, veteran. Experience limited to survey work. Desires experience with a consultant or with large design and construction company. Available after May 15, 1949. Apply to File No. 3129-W.

GRADUATE ENGINEER, age 32 married, desires position leading to increased responsibility in railway or its equipment field. B.Sc. Eng. (Electrical) University of Manitoba (44), two years engineer officer Royal Canadian Navy operating and repair of steam turbines and diesel electric generators, nine years railway machine shop, one year detail and design of welded pressure vessels, steam generators, desuporheaters, one winter a lecturer in Mechanical Engineering, one year in railway signal engineering on signal layout, installation, circuit design. Apply to File No. 3130-W.

MECHANICAL ENGINEER, Saskatchewan, 1946, Jr.E.I.C., married, age 25. Presently located in Winnipeg area, desires permanent position in industrial plant engineering. Experience includes teaching, construction, sales, equipment design and installation. Available May 1. Apply to File No. 3131-W.

EXECUTIVE. M.E.I.C., B.A.Sc., P.Eng. Wide managerial exeperience in all phases of development, production, sales, organization, cost control. Age 39. Married, family. Willing to consider position with established concern requiring senior executive. Apply to File No. 3138-W.

MECHANICAL ENGINEER, Jr.E.I.C., (B.Eng., McGill, '47), one year experience in design and draughting and some construction work. Presently completing professional course in Industrial Relations. Interested in becoming established with industrial firm to do study work, job evaluation, wage incentive plans, personnel supervision, etc., where background of engineering could be useful. Some knowledge of French. Area of Ontario, Quebec or B.C. Available on month's notice. Apply to File No. 3149-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc., (E.E.), U.B.C. 49. Married, age 33, Electrical experience with R.C. Signals (overseas 6 yrs.). Desire employment in power or electronics. Available May 1, 1949. Apply to File No. 3154-W.

ELECTRICAL ENGINEER, M.E.I.C., I.E.G., Prof. Eng. Quebec. Age 35. Several languages spoken fluenty. Married, no children. Extensive practical experience in plant maintenance and trouble shooting, seeks resident position with industrial firm; available at short notice. No objection to go to country. Apply to File No. 3155-W.

ELECTRICAL ENGINEER, S.E.I.C., recent graduate of Nova Scotia Technical College, married, five summers' pre-graduation experience plant electrical maintenance, desires employment in Montreal area, preferably in design, testing, or small-scale production of electronic or communications equipment. Apply to File No. 3156-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C., Canadian, 29 years of age, married, one child. Seven years varied experience mostly with one employer, in general machine-shop, foundry, drafting, process and mining industries. At present assistant mechanical superintendent of mining concern in South America. Returning to Canada in June. Desire position, preferably in Canada or the U.S.A. Apply to File No. 3157-W.

ELECTRICAL ENGINEER, S.E.I.C., S.A.I.E.E., age 23, married, B.Sc. '48 from University of New Brunswick, at present taking one year post graduate work at the University of London on Beaverbrook Overseas Scholarship. Summer vacations spent in the Power & Paper Industry. Returning to Canada early in September. Apply to File No. 3161-W.

GRADUATE ENGINEER, M.E.I.C., with broad administrative experience in manufacturing. Responsibilities have included development of national sales organization, planning of national advertising campaign, purchasing for light metal manufacturing plant, product promotion and development, patents and cost accounting. Youthful, aggressive, dependable and loyal. Widely travelled. Complete personal file available. Apply to File No. 3162-W.

GRADUATE MECHANICAL ENGINEER (McGill), M.E.I.C., P.Eng. Que., married, bilingual, five years sales experience in heavy plant and contracting equipment in Province of Quebec. Responsibilities include sales promotion, sales engineering in regards to steam and electrical equipment and pumps, supervision of installations and recommended maintenance schedules. Some experience in electrical installations, welding and surveying. Desires position of responsibility with progressive firm, not necessarily in sales. No locality preference. Presently employed. Apply to File No. 3163-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department. This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

MECHANICAL ENGINEER, M.E.I.C., McGill 1942, age 28 presently engaged a design, sales and construction enginee with small company manufacturing an installing heavy industrial machinery demand for which is falling off due t heavy oil production. Has had experience, R.C.E.M.E. Overseas, steel de signing and detailing. Would conside any employment offering interestin problems, responsibility and future pro motion. Apply to File No. 3164-W.

MECHANICAL ENGINEER, S.E.I.C. P.Eng. Ont., Toronto 48, married, family, age 35. 7 years drafting, shop experience. 1 year design engineer, in pulp and paper line and heavy industrial equipment. Interested in plant en gineering or design, desires permanen position with responsibility. Apply t File No. 3180-W.

CIVIL ENGINEERING STUDENT, S.E.I.C wants permanent position. Graduating May, 1949 from the University of New Brunswick, Veteran R.C.A.F., navigator married, 3 children. Position preference are with a consulting engineer or some company doing inspecting and supervising work on construction. Apply t File No. 3182-W.

CHEMICAL ENGINEER, S.E.I.C., (Laval '49), B.A.Sc., P.Eng. Age 23. Single Experienced in woodcutting operations galvanizing mill, coal carbonization, re covery and refining of coal by-products Desirous of obtaining a position with an engineering consulting firm dealing with chemical engineering problems (e.g. chemical plants, installation o heating systems, air conditioning, etc.) Would also consider engineering work with a well established company, preferably in the province of Quebec Available June 1st, 1949. Apply to File No. 3183-W.

RECENT GRADUATE, S.E.I.C., single age 24, veteran. Now completing post-graduate study in Mechanical Engineering at Princeton University. Objective of this post-graduate work has been to develop as thorough a background as possible for manufacturing and industrial administration. At present working on the thesis in quality control. Interested in any type of opening that will be available in June. Apply to File No 3186-W.

STUDENT, S.E.I.C., in 4th year Mechanical Engineering, U. of S., graduating this spring, desires a position with the Petroleum Industry. Experience includes survey work, petroleum sales drilling and testing oil wells, and radar technician with the R.C.A.F. In excellent health, 26 years of age, married Apply to File No. 3187-W.

MECHANICAL AND ELECTRICAL ENGINEER, M.Sc., A.M.I.E.E., married, age 30. Also holds honours degree in physic and has good knowledge of mathematics. Desires position where these qualifications would be of value, probably in development, design or research and preferably in the field of mechanical engineering. Experience includes five years in the technical branch of the R.A.F. and eighteen months as mechanical engineer in large industrial concern. Apply to File No. 3188-W.

ELECTRICAL ENGINEERING STUDENT S.E.I.C., graduating this spring from U.N.B. Veteran, age 27, married. 2 children. 4 years with R.C.A.F. signals radar, summer 1948 with National Research Council in microwave laboratory. Entering McGill September 1948 for post graduate work in communications. Desires position in or near Montreal for summer — Good references available. Apply to File No. 3190-W.

Library Notes

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

CORROSION HANDBOOK:

H. H. Uhlig, editor; sponsored by The Electrochemical Society, Inc., New York, Wiley; London, Chapman and Hall, 1948. 1188 pp., illus., 9¼ x 6 in., cloth $12.00.

Reviewed by C. M. Carmichael*.

The Corrosion Handbook as edited by Dr. Uhlig is the most comprehensive book of its kind published. There has long been a need for an authentic book on corrosion and methods of overcoming it. In producing this book, Dr. Uhlig has had the co-operation of 102 scientists and engineers, each one an acknowledged authority in his particular field.

Some of the data has never been published before, while a great deal of the other material has been published in various articles and publications, but this volume presents the subject matter in concise form, readily found for practical use.

The prestige of the contributors inspires the reader to accept as accurate the data to the extent of its development. The development of the subject, however, is still in its infancy, and further research will doubtless be one of the fruits of this excellent book.

It is impossible to review all the many subjects treated in this volume of over 1100 pages, but the arrangement of the data is so well indexed that any particular subject will be readily found even by those making their first acquaintance with this subject.

Engineers whose activities include specifying of materials subject to corrosion should have and use this work.

Vice-President, Stainless Steel Division, Shawinigan Chemicals Ltd., Montreal, P.Q.

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS. PAPERS:

Small Power Transformers for Aircraft Electrical Equipments, *A. Langley Morris.*

Transformer design and constructional features are presented with a view of obtaining the smallest possible transformer for a given rating. A design for a 500 V.A. 1600 cycle transformer is given in the appendix.

Some notes on the Design of H.V. Transmission Lines with Special Reference to Indian Conditions, *A. F. Coventry.*

Deals with design conditions for overhead lines in India. Discusses choice of conductor size and voltage for long primary lines. The performances o. three examples of long H.V. transmission lines, as calculated by rigorous methods, are tabulated in order to show that the assumptions which have been made in arriving at the simple formulae which are used to calculate natural power and the distance it can be transmitted for given power loss, are sufficiently close for all practical purposes.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Canadian Master Tax Guide for 1948 Returns and 1949 Policy Based upon the Income Tax Act, Income War Tax Act, 4th ed:

CCH Canadian Limited, Toronto, Montreal, 1949. 222 p., illus.

Centennial History of the Pennsylvania Railroad Company, 1846-1946:

G. H. Burgess and M. C. Kennedy. Philadelphia, Pennsylvania Railroad Company, 1949. 835 p., illus., cloth.

Civil Engineer in War; a Symposium of Papers on War-time Engineering Problems:

Institution of Civil Engineers, London, 1948. 3 vols., illus., paper.

Engineer in Industry:

E. H. Schell. Montreal, Association des Diplômés de Polytechnique, 1948. 48 p., illus., paper.

Engineering Laminates:

A. G. H. Dietz, editor. New York, Wiley; London, Chapman and Hall, 1949. 797 p., illus., cloth.

Engineering with Rubber:

W. E. Burton and the B. F. Goodrich Company. New York, Toronto, London; McGraw-Hill, 1949. 486 p., illus., cloth.

Fluid Mechanics, 2nd ed:

R. C. Binder. New York, Prentice-Hall, 1949. 361 p., illus., cloth.

Introduction to Chemical Science, 2nd ed:

W. H. Hatcher. New York, Wiley; London, Chapman and Hall, 1949., 449 p., illus., cloth.

Lampes à Eclairs Lumière Blanche et leurs Applications:

Marcel Laporte. Paris, Gauthier-Villars, 1949. 90 p., illus., paper.

Long Sault Rapids, St. Lawrence River; an Enquiry into the Constitutional and other Aspects of the Project to develop Power therefrom:

A. V. White. Ottawa, Commission of Conservation, Committee on Waters and Water-Powers, 1913. 384 p., illus., cloth.

Metal Working and Heat-Treatment Manual, Volume 3—Surface Hardening Processes:

F. Johnson. London, Elek, 1949. 185 p., illus., cloth.

Molybdenum; Steels, Irons, Alloys:

R. S. Archer, J. Z. Briggs, C. M. Loeb, Jr. New York, Climax Molybdenum Company, 1948. 391 p., illus., cloth.

Notes on Soldering:

W. R. Lewis. Greenford, Middlesex; Tin Research Institute, 1948. 88 p., illus., paper.

Patent Law for Lawyers, Students, Chemists, and Engineers, 2nd ed:

C. H. Biesterfeld. New York, Wiley; London, Chapman and Hall, 1949. 261 p., cloth.

Railway and other Steamers:

C. L. D. Duckworth and G. E. Langmuir. Glasgow, Shipping Histories Ltd., 1948. 340 p., illus., cloth.

LIBRARY REGULATIONS

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Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

Non-members may consult the library, but may not borrow material.

Rayonnement, Photométrie et Eclairage:

Merry Cohu. Paris, Gauthier-Villars, 1949. 398 p., illus., paper.

Science and Engineering of Nuclear Power, Volume 2:

Clark Goodman, editor. Cambridge, Mass., Addison-Wesley, 1949. 317 p., illus., cloth.

Telephony: a Detailed Exposition of the Telephone Exchange Systems of the British Post Office, Volume 1:

J. Atkinson. London, Pitman, 1948. 513 p., illus., cloth.

Trade-Marks:

H. Bennett. Brooklyn, Chemical Publishing Co., 1949. 479 p., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

American Society for Engineering Education. Engineering College Research Council:

Proceedings of the Annual Meeting, 1948.

Canada 1949: Official Handbook of Present Conditions and Recent Progress:

Dominion Bureau of Statistics, Ottawa, 1949.

Canada. Dominion Water and Power Bureau:

Water-Power Resources of Canada, 1948.

Consulting Engineer Year Book 1949:

Princes Press Ltd., London, 1949.

Engineering Foundation:

Annual Report, October 1, 1947 to September 30, 1948.

Kelvin Medal, 1947:

Report of the Proceedings at the Presentation on the 7th October, 1948.

TECHNICAL BULLETINS, ETC.

American Chemical Society:

Abstracts of Papers presented at the 115th National Meeting, March 29th, 1949.

Harvard University. Graduate School of Engineering. Publications:

No. 459—Polarographic Determination of Dissolved Oxygen in Water and Sewage, E. W. Moore, J. C. Morris, D. A. Okun.

Institute of Metals. Reprints:

Consideration of the Nature of Brittleness at Temperatures above the Solidus in Castings and Welds in Aluminum Alloys, W. I. Pumphrey and P. H. Jennings.—Consideration of the Nature of Brittleness at Temperatures below the Solidus in Castings and Welds in Aluminium Alloys, W. I. Pumphrey and D. C. Moore.—Flow of Metal in Tube Extrusion, C. Blazey and others.—High-Temperature Tensile Properties of Cast Aluminium-Silicon Alloys and their Constitutional Significance, W. I. Pumphrey and P. H. Jennings.—Recovery and Recrystallization of Rolled Aluminium of Commercial Purity, P. C. Varley.—Some Metallurgical Problems of Importance to Aircraft, H. Sutton.

Institution of Electrical Engineers. Proofs:

Analogies between the Vibrations of Elastic Membranes and the Electromagnetic Fields in Guides and Cavities, E. C. Cherry.—Automatic Control of Lead-Acid-Battery Charging Equipment, R. A. Harvey.—Development of Q-Meter Methods of Impedance Measurement, A. J. Biggs and J. E. Houldin.—Electric and Diesel-Electric Traction on the Netherlands Railways, H. J. Van Lessen.—Overhead Line Regulations, H. W. Grimmitt.—Some Notes on the Design of H. V. Transmission Lines, with Special Reference to Conditions in India and Pakistan, A. F. Coventry.

Institution of Mechanical Engineers. Advance Copies:

Causes of Flue Gas Deposits and Corrosion in Modern Boiler Plants, W. F. Harlow.—Crankshaft Damping, P. Draminsky.—Sulphur in Diesel Fuels, Ir. J. J. Broeze and A. Wilson.—Some Current Types of Marine Diesel Engine, C. C. Pounder.—Thermal Analysis of the Contra-Flow Regenerative Heat Exchanger, C. E. Iliffe.

International Civil Aviation Organization. First South East Asia Regional Air Navigation Meeting, New Delhi, November-December 1948. Publications:

Final Report, Aerodromes, Air Routes and Ground Aids Committee (Doc SE/301, AGA-SE/100).—Final Report of the Air Traffic Control Committee (Doc SE/302, ATC-SE/100).—Final Report of the Communications Committee (Doc SE/303, COM-SE/100).—Final Report of the Frequency Planning Sub-committee (Doc SE/303A, COM-SE/100).—Final Report of the Meteorological Committee (Doc SE/304, MET-SE/100).—Final Report of the Search and Rescue Committee (Doc SE/305, SAR-SE/100).

Manitoba. Department of Mines and Natural Resources. Mines Branch. Publications:

Bibliography of Geology, Coal, Oil, Natural Gas, and Industrial Minerals in the Post-Cambrian Region of Southern Manitoba to 1945, L. B. Kerr.

National Association of Corrosion Engineers:

Abstracts of Papers to be Presented at the April 11-14, 1949 Conference at Cincinnati, Ohio.

North-East Coast Institution of Engineers and Shipbuilders. Advance Copies:

Cavitation of Screw Propellers, R. W. L. Gown.

Princeton University. Industrial Relations Section. Selected References:

No. 26—Revision of the Taft-Harley Act.

Purdue University. Engineering Experiment Station. Research Series:

No. 105—Research in Venting Direct Gas Heaters when no Chimney Connections are Available, S. C. Hite and J. L. Bray.—No. 106—Research in Home Humidity Control, S. C. Hite and J. L. Bray.

U.S. Bureau of Standards. Applied Mathematics Series:

No. 4—Tables of Scattering Functions for Spherical Particles.

...Building Materials and Structures Reports:

BMS 114 Temperatures in a Test Bungalow with Some Radiant and Jacketed Space Heaters.

U.S. Highway Research Board. Bulletins:

No. 15—Parking.

STANDARDS, SPECIFICATIONS, ETC.

American Society for Testing Materials. 1948 Supplement to Book of A.S.T.M. Standards including Tentatives:

Part 1-A—Ferrous Metals.—Part 1-B Non-Ferrous Metals.—Part 2—Non-metallic Materials—Constructional.—Part 3A—Nonmetallic Materials—Fuels, Petroleum, Aromatic Hydrocarbons, Soaps Water, Textiles.—Part 3-B—Nonmetallic Materials—Electrical Insulation, Plastics, Rubber, Paper, Shipping Containers, Adhesives.

American Standards Association Standards:

ASA C39.1—1949—Electric Indicating Instruments; Part 1—Switchboard and Panel Instruments.—ASA C57.12-1949—Distribution, Power and Regulating Transformers, and Reactors other than Current-Limiting Reactors.

British Standards Institution. Standards:

BS 771:-1948—Synthetic Resin (Phenolic) Moulding Materials.—BS 1493: 1948—Polystyrene Moulding Materials.—BS 1494: 1948—Fixing Accessories for Building Purposes.—BS 1499: 1949—Sampling Non-Ferrous Metals.—BS 1524: 1949—Cellulose Acetate Moulding Materials.

...Code of Practice:

CP(B) 827—Tile and Slab Flooring.

Canadian Standards Association. Standards:

CSA C22.1-1947—Supplement No. 1—Tentative Interim Revisions to Canadian Electrical Code, Part 1, 5th ed, 1947.—CSA G26-1949—Hot-Rolled Corbon Steel Bars, 4th ed.

PAMPHLETS, ETC.

Comparison of Notch Tests and Brittleness Criteria:

C. J. Osborn and others. (American Welding Society Reprint).

Flow-Line Planning in Factory Layout:

H. M. Harman. Manchester, Emmott, 1948. (Mechanical World Monographs No. 48).

Large Displacement Deformeter Apparatus for Stress Analysis with Elastic Models:

W. J. Eney. Bethlehem, Pa., Lehigh University, 1949.

Method for Vibration Fatigue Tests of Stranded Conductor:

Ai-Ting Yu and B. G. Johnston. Bethlehem, Pa., Lehigh University, 1949.

Nouveau Cycle Thermodynamique à Vapeur Surchauffée . . .:

Emile Guarini. Bruxelles, the author, 1949.

Panamerican Engineering Congress. First, Rio de Janeiro. July 15-24, 1949:

Agenda and Regulations. Rio de Janeiro, the Congress, 1949.

Plastic Behavior of Wide Flange Beams:

W. W. Luxion and B. G. Johnston. (American Welding Society Reprint).

Right Finish; Right Color:

R. G. Maus. (Reprinted from Safety Engineering Magazine, December 1948).

Saguenay River, Quebec:

A. L. Harvey. Newcastle upon Tyne, Newcastle upon Tyne and District Association of the Institution of Civil Engineers, 1948.

Scientists in Uniform, World War II; a Report to the Deputy Director for Research and Development, Logistics Division, General Staff, U.S. Army:

Dept. of the Army, Washington, D.C., 1948.

Studies of Continuous Bridge Trusses with Models:

W. J. Eney. Bethlehem, Pa., Lehigh University, 1949.

Turbo-Supercharging of Internal Combustion Engines:

C. V. J. Mackenzie-Kennedy. London, Draughtsman Publishing Company for the Association of Engineering and Shipbuilding Draughtsman, 1947.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

AERONAUTICAL CONFERENCE, LONDON, 3rd-5th SEPTEMBER, 1947:

Convened by The Royal Aeronautical Society and The Institute of the Aeronautical Sciences, edited by J. L. Pritchard and Joan Bradbrooke. London, Royal Aeronautical Society, 1948. 704 pp., illus., 10 x 7 in., cloth, £2.12.6 for members of the Conference, £3.12.6 for non-members.

The papers and discussions presented at this conference cover theoretical considerations on stability and control at high speeds; control in low speed flight; modern operational factors affecting airworthiness; icing problems; high speed testing in the Southern California Cooperative Wind Tunnel; high speed performance; the economics of personal aircraft; electronic control and instrumentation of aircraft; structural problems of large aircraft; thin walled monocoques; résumé and analysis of NACA wing-flow tests; practical design problems arising from sweepback; some novel structural properties of stressed skin wings; some aspects of transport aeroplane development; helicopter power plant installation; turbine engine icing problems; factors affecting future development of reciprocating engines; personal aircraft, an American appraisal; rotor systems and control problems in the helicopter; and the propeller turbine aero-engine.

BRITISH STANDARDS INSTITUTION. STANDARDS:

London, the Institution, 1948.

B.S. 15:1948—Structural Steel for Bridges, etc., and General Building Construction. *2/–.*

This revision includes a requirement for a minimum yield stress for steel manufactured to this standard. Steel complying with this standard is, in general, suitable for welding of all sizes.

B.S. 460 and B.S. 1205:1948—Cast Iron Rainwater Goods. *5/–.*

These standards deal with quality of materials, freedom from defects, facilities for inspection, marking and rejection. The specific clauses deal with dimensions, weight, thickness, sockets, ears, hammer test and finishes relating to gutters. There are 33 tables of dimensions and over 60 illustrations.

HALF-HOURS WITH GREAT SCIENTISTS; THE STORY OF PHYSICS:

Charles G. Fraser. Toronto, University of Toronto Press; New York, Reinhold; London, Oxford University Press, 1948. 527 pp., illus., 9½ x 6¼ in., cloth. $6.00.

This book has been written in the hope of bringing some of the most important passages of the literature of science within the reach of every one. It introduces great scientists so that the reader may learn from them the parts they played in the advancement of science and of the human race. The author describes, in terms not too technical for the average reader, the story of mechanics, acoustics, optics, thermics, and electricity and magnetism, from their earliest beginnings to the scientific achievements of the present day. There is an abundance of quotations and illustrations which make the story vivid and interesting reading.

SOURCES OF ENGINEERING INFORMATION:

Blanche H. Dalton. Berkeley and Los Angeles, University of California Press, 1948. 109 pp., 9½ x 6¼ in., cloth, $4.00.

This is a list of American source material in engineering subjects, designed as a guide to locating information quickly and accurately from among the mass of material published on engineering subjects. It includes indexes to periodical and serial literature; abstracts; means of locating and identifying periodicals; bibliographies; reference books (general, biographies, encyclopedias, dictionaries, handbooks and manuals, mathematical tables, manufacturers' directories); trade catalogues; and standards and specifications. A short note is appended to many of the entries, and each section is prefaced by an explanation of the use to which that type of reference material can be put. Each section is subdivided by subject, so that it is easily possible to locate the source material for one particular type of engineering. Entries are clear and complete.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

APPLIED MATHEMATICS FOR ENGINEERS AND SCIENTISTS.

S. A. Schelkunoff. D. Van Nostrand Company, New York, Toronto, London, 1948. 472 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50 in Canada.

This book is devoted to those branches of mathematics which are needed in mathematical physics and engineering. It is divided into two parts, one considering general mathematical methods, and the other, special transcendental functions. Such topics are included as power series, vector analysis, differential equations, linear analysis, Bessel functions, and Legendre functions.

CIVIL ENGINEER IN WAR, A SYMPOSIUM OF PAPERS ON WAR-TIME ENGINEERING PROBLEMS.

Institution of Civil Engineers, Great George Street, London, S.W.1, England, 1948. Illus., diagrs., charts, maps, tables, 8½ x 5½ in., stiff paper, $9.75 in Canada per set of 3 volumes. (Engineering Institute of Canada, Montreal, in charge of sale and distribution in Canada).

A total of sixty-eight papers on war-time engineering problems is included in those three volumes. Vols. 1 and 2 deal with specific operations with respect to airfields, roads, railways, bridges, docks, harbors, and storage systems. Vol. 3 contains more general treatment of problems in the fields of hydraulics, structures, surveying, tunnelling and the properties of materials. Hundreds of photographs and diagrams illustrate the important aspects of each paper.

FIELD ENGINEERING, 22d. ed.

W. H. Searles and H. C. Ives. 22nd ed. by P. Kissam. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 422 pp., diagrs., charts, tables, 7 x 4 in., cloth. Vol. I (Text) $3.75; Vol. II (tables) $3.75; combined Vols. I & II, $6.50.

This standard handbook for railroad surveyors and builders has again been revised and modernized to conform with developments of the past few years. New material added includes methods of air mapping, theory and application of the vertical curve, basic economic aspects of highway and railway location, the two-base method for precise altimetry, and the latest surveying techniques. The 400 pages of tables may be had separately or in the combined volume.

GAS TABLES, THERMODYNAMIC PROPERTIES OF AIR, PRODUCTS OF COMBUSTION AND COMPONENT GASES AND COMPRESSIBLE FLOW FUNCTIONS.

J. H. Keenan and J. Kaye. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 238 pp., diagrs., tables, 10¼ x 7¼ in., cloth, $5.00.

Invaluable in the calculation of engineering problems involving air, this volume supersedes "Thermodynamic Properties of Air" by the same authors. The properties of air have been re-examined and re-calculated. Additions include the properties of combustion products of hydrocarbons and their constituent gases. The tables for the analysis of flow of compressible fluids have been greatly extended. For engineering application to the design of power apparatus, the precision is of the same order as that of modern steam tables.

INDUSTRIAL ELECTRONICS AND CONTROL.

R. G. Kloeffler. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 478 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.50.

This book is designed for the student whose major interest is in the electric power, mechanical or chemical engineering field, rather than for the communications major. Beginning with Bohr's early theory of the atom, the author proceeds to the basic theory of electron tubes, associated circuits, and control component devices. The latter part of the book covers the major applications in the industrial and commercial fields.

LOGGING.

N. C. Brown. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 418 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $5.00.

A combination and revision of two earlier works by the author, this book covers the methods and procedures of logging used in all parts of North America. Recent developments in mechanical logging are fully covered, as are the important changing aspects of logging methods. Both land and water log transportation is considered.

MACHINE DESIGN DRAWING ROOM PROBLEMS, 4th ed.

C. D. Albert. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 519 pp., illus., diagrs. charts, tables, 9¼ x 5¾ in., cloth, $5.00.

This book is designed to include in a single volume all the information necessary for drawing room or laboratory courses in machine design. This new edition has sixteen comprehensive problems on machine design and ten chapters of reference information. Fifteen of the old chapters have been revised, and the chapters on worm gearing and allowable stresses completely rewritten. Three new problems have been added.

MATHEMATICS AT WORK.

H. L. Horton. Industrial Press, New York 13, 1949. No pagination, diagrs., tables, 9¼ x 6 in., fabrikoid, $6.00.

This book is a working manual for machine designers, tool engineers, gage designers, mechanical draftsmen, and technical or trade students. It reviews the fundamentals of arithmetic, algebra, geometry and trigonometry. There is a comprehensive discussion of problems and their solution and an explanation of special aids in computation. 145 pages of standard mathematical tables, including logarithmic and trigonometric tables, are included.

MOTION AND TIME STUDY, 3d. ed:

R. M. Barnes. John Wiley & Sons, New York; Chapman & Hall, London, 1949, 559 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00 in Canada.

This standard text presents the basic principles that underlie the successful use of motion and time study, supplementing each with illustrations and practical examples. In this third edition most of the chapters have been revised and new material added. Five new chapters deal with process analysis, gang process charts, activity charts, and man and machine charts. Action photographs have been included. There is new material on rating operator performance and motion and time study training programs.

OIL SHALES AND SHALE OILS.

H. S. Bell. D. Van Nostrand Company, New York, Toronto, London, 1948. 157 pp., illus., diagrs., charts, tables, 9¼ x 6 in., $5.00 in Canada.

Beginning with geographical distribution and the history of exploitation, this book presents the existing information on the methods and economics of producing oil from shale. The oil shales of the world are discussed. Mining methods, retorting, and refining of oil from the shale are explained. The relative costs of this oil source are tabulated References from a wide variety of sources are given.

ROCKET PROPULSION ELEMENTS.

G. P. Sutton. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 294 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.40 in Canada.

Designed as a reference manual as well as a college text, this book presents both the basic elements and the technical problems of rocket propulsion systems. Emphasis is placed more on liquid propellant rockets rather than on solid propellant units, but the material on thermodynamic, thermochemical and ballistic principles applies to both types. Examples, problems, illustrations and references are included.

SCIENTIFIC FOUNDATIONS OF VACUUM TECHNIQUE.

S. Dushman. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 882 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $15.00.

This book is a comprehensive study of all phases of achieving, maintaining and measuring very low gas pressures. It presents a survey of fundamental ideas in physics, chemistry and metallurgy, which will be found useful in dealing with problems in this field. References to the literature appear as footnotes. Both scientific research and practical engineering applications are considered.

SEMI-FIREPROOF CONSTRUCTION.

H. R. Staley. D. Van Nostrand Company, Toronto, New York, London, 1948. 327 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50 in Canada.

This book deals with the details of construction and the sequence and methods of erection of buildings within the scope of semi-fireproof construction. A discussion of soils and piling foundations is presented. The assembly of forms for walls and the mixing, handling and placing of concrete for both walls and floors are discussed in detail. Exterior masonry wall construction is dealt with both from the point of structural integrity and water-tightness. Tools and equipment are discussed as each operation is considered.

STEAM BOILER YEARBOOK AND MANUAL (IV).

S. D. Scorer, editor. Paul Elek Publishers, Ltd., London, E.C.1, 1948. 589 pp., illus., diagrs., charts, tables, 5½ x 5½ in., cloth, 30s.

This book contains an accumulation of useful data on the steam-generating field. Part I presents illustrated descriptions of almost every kind of steam boiler and associated plant and is a guide to modern British steam boiler practice. Part II deals mainly with operating problems and incorporates material on modern boiler practice and development taken from English and foreign sources.

TRENDS IN ENGINEERING EDUCATION, THE COLUMBIA EXPERIENCE.

J. K. Finch. Columbia University Press, New York, 1948. 140 pp., charts, tables, 8 x 5½ in., cloth, $2.00.

Although presenting the philosophy of education of one particular school, the Columbia School of Engineering, this small volume should be of interest to all engineering educators. Two of the most important problems discussed are the broadening of engineering curricula to include basic subjects of general education and the development of graduate instruction and research in engineering science. Teaching methods and the problem of faculty appointments have not been considered.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

ELECTRIC RESISTANCE STRAIN GAUGES.

W. B. Dobie and P. C. G. Isaac. English Universities Press, Limited, London, 1948. 114 pp., illus., diagrs., charts tables, 8¾ x 5½ in., linen, 15s.

This book is of value to the experimenter or development engineer who is required to evaluate strains in load bearing machines or structures. It deals with the various difficulties encountered in using electric resistance strain gauges and suggests methods for overcoming them. The basic mathematical and electronic theory needed in the use of this tool is included. The authors have reviewed and edited the technical literature which appeared in English and American journals.

MEASUREMENT OF STRESS AND STRAIN IN SOLIDS.

Institute of Physics, 47 Belgrave Square, London, S.W.1, England, 1948. 114 pp., illus., diagrs., charts, tables, 9½ x 6 in., linen, 17s.6d. plus 10d. postage; U.S.A. $4.00. (Physics in Industry).

This book is based on the Proceedings of a Conference arranged by the Institute of Physics and held during July 1946. Three papers survey the fields of electrical resistance strain gages, recent developments in photoelasticity, and methods for measurement of strain, such as extensometers and the use of brittle lacquer coatings. The other papers are concerned with the details of the applications of various techniques to specific problems.

SUPERSONIC FLOW AND SHOCK WAVES.

R. Courant and K. O. Friedrichs. Interscience Publishers, Inc., New York, 1948. 464 pp., diagrs., tables, 9¼ x 6 in., linen, $8.00.

Helpful to engineers, physicists, and mathematicians, this book treats basic aspects of the dynamics of compressible fluids in mathematical form. It presents a systematic theory of nonlinear wave propagation, particularly in relation to gas dynamics. Classical as well as recent developments are included. No attempt has been made to cover the entire field nor to provide summaries of results which could be used as recipes for attacking specific engineering problems.

SECOND INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING, ROTTERDAM

June 21-30, 1948

The seventh volume of the *Proceedings* will be published when sufficient orders are received. It will contain 41 papers from all parts of the world, plus 23 papers prepared by French engineers, and published in "Travaux" for June, 1948.

Applications for this supplementary volume should be sent to the Secretary of the Conference, Oostplantsoen 25, Delft, Netherlands, accompanied by a draft for 15 Dutch guilders (approx. $6.40).

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

A new truck tire, developed by the Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., is claimed to have " built in shock absorbers ".

The Company claims that by a unique process, shock, stress and strain are cushioned in the carcass of the tire by layers of soft rubber between the plies. Company tests indicate reduced wear and tear on the tire, less damage to the carcass and reduced costs to users because of the longer running life.

•

To create interest in wood the Osmose Wood Preserving Company of Canada Limited conducted a guessing contest at the Sportsmen's Show, held recently in Montreal. A four-foot section of an elm tree was displayed at their booth and visitors were invited to guess the age of the tree. Nearly six thousand five hundred people competed. The age of the tree, which was grown in Montreal, was ninety-five years. Forty-nine people had the correct answer. The highest guess was twenty thousand four hundred and thirty-one years and the lowest, eleven years.

•

Victor M. Drury, president of the Canadian Car & Foundry Co. Ltd., stated that the year 1948 was the greatest in history for the railway rolling stock industry. Production would have reached even greater heights had more steel been available.

For the Company the feature of the year was large orders from Canada's own railways for rolling stock replacement. Mr. Drury is of the belief that by 1950 Canadian railways will have largely overcome rolling stock deficiencies.

•

In a survey of the water power resources of Canada, compiled by the Dominion water & power service bureau, it is stated " Progress in hydro-electric development in Canada during 1948, as measured by plants coming into operation, was at a fairly high rate and a huge programme of construction is at present underway or planned which will rapidly increase capacity during the next few years ".

The survey lists, by provinces, the total water power resources of Canada and the total recently computed from the records of the bureau. 25,722,900 hp. at ordinary minimum flow and 40,124,100 hp. at ordinary six month flow. The figures are based on eighty per cent efficiency.

Since the beginning of the present century water power development in Canada has grown from 143,156 hp. to 10,870,718 hp. installed by the end of 1948. The growth in the total of hydraulic installation has been continuous and fairly consistent, particularly since 1920. The average increase per year has been, roughly, 300,000 hp.

Quebec is richest in water power resources, containing over 32 per cent of the total recorded for the Dominion. It also ranks highest in developed power. The present installation in the province of nearly 6,000,000 hp. is 55 per cent of the total for all provinces. Ontario also has large power resources and is exceeded only by Quebec and British Columbia in this respect.

•

The volume of sales of the Northern Electric Company Ltd., in 1948 set a new record in the Company's 35 year history. Sales for the year topped by 22 per cent the previous high set in 1947. Sales to the Bell Telephone Company of Canada represented 40c out of every dollar of sales. During the year there was a reduction in inventories by more than \$3,600,000. Wages and salaries at \$29,509,000 were higher than ever before in the history of the Company and surpassed the 1947 figure by nearly \$6,000,000. The total number of employees at the end of the year stood at 12,385 and of these people more than 10 per cent have over twenty-one years of service. Further expansion, during 1949, is anticipated and whole scale operation in the new plant is anticipated.

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The 37th National Safety Congress and Exposition will be held October 24 to 28 in Chicago, Ill. For further information write to R. L. Forney, general secretary, National Safety Council, 20 North Wacker Drive, Chicago 6, Ill.

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At the recent International Nickel annual meeting, held in Toronto, Robert C. Stanley, chairman of the board of directors, said " Our world sales of nickel in all forms in 1948 were 240,098,274 pounds, compared with 205,278,868 pounds in the year 1947. Over 90 per cent of this total was consumed in the United States, Great Britain and Canada. Consumption outside of these three countries was only a small fraction of pre-war volume."

Mr. Stanley also stated that during the past decade the Company has been forced to mine ores of lower grade. To illustrate this point he stated that 43 pounds of nickel were obtained from each ton of ore mined in 1938 while in 1948 this figure had dropped to 27 pounds.

The Company's sale of copper for Canadian consumption in 1948 was 90 per cent greater than in the years immediately preceding the war. Mr. Stanley referred to progress made in the flash smelting process. He said " Results obtained in our pilot unit have justified the planned construction of an oxygen plant and of an initial flash smelting furnace on a commercial scale. The new process will permit a considerable saving in coal requirements, and at the same time will serve both to increase the production of sulphuric acid and to enable the production of liquid sulphur dioxide from furnace exhaust gases by Canadian Industries Limited. This represents another step forward in the maximum utilization of our ores, an objective to which we are devoting continuing and fruitful research."

•

A programme of graduate work in engineering, physics, and chemistry leading to the master's degree, is to be inaugurated by Drexel Institute of Technology, Philadelphia. The programme will go into operation commencing with the fall term of this year.

•

On April 26th the Canadian Standards Association announced that two new codes have been issued with respect to radio interference. These codes deal with interference from industrial, scientific, and medical apparatus and interference caused by railway and other signal and communication systems. For copies of these codes apply to the Canadian Standards Association, National Research Building, Ottawa, Ont.

•

Great Britain is establishing air corridors ten miles wide. They will form a system of aviation highways at heights of between 5,000 and 11,000 feet. These highways have been established to insure safer flying and to prevent collisions between aircraft in poor visibility. Both civil and military planes will be expected to conform to this new form of traffic control.

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The world's first pressurized blast furnace is being built in Scotland. Working on the principle of the domestic pressure cooker, the new furnace will speed up steel output from 15 per cent to 20 per cent.

•

What is claimed to be the world's most powerful electric transformer has been shipped from the Westinghouse Electric Corporation's transformer plant at Sharon, Pa., to help increase the supply of power in the Detroit area.

Rated at 145,000 kilowatt-amperes and capable of handling 195,000 horsepower of electrical energy, the machine is big enough to supply all the electric power needed for a city the size of Winnipeg. The 125-ton unit will be installed in the giant Trenton Channel Station of the Detroit Edison Company. It will be used to boost the station's generating voltage from 15,000 volts to 135,000 volts. The unit contains 56 tons of "Hipersil"— silicon steel—core material, 63 miles of copper wire and 6,000 gallons of insulating and cooling oil.

This new three-phase transformer is rated 30 per cent higher yet it is smaller and 17 tons lighter than the most powerful transformer previously built. This combination of high power and light weight is the result of the use of "shell-form" construction coupled with "form fit" design of tank which houses the transformer core and windings. Size and weight were also further reduced by using "Hipersil", a special silicon steel used by Westinghouse which, it is claimed, can carry one-third more magnetic flux than steels previously used.

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A new line of a-c Arc Welders, featuring increased welding range and stepless precision current control, is available from Canadian General Electric Company. The new welders are available in 200, 300, 400, and 500 ampere models for indoor manual welding; 750 and 1000 ampere models for machine and submerged melt welding; and a special 200 ampere model for light-duty, job-shop welding. The 300, 400, and 500 ampere models are offered also in weather-resistant enclosures with "Idlematic" control for both indoor and outdoor operation.

The new welders have an open-circuit voltage of 75 volts, providing good welding performance through added arc stability. "Idlematic" controls on the weather-resistant models automatically reduce the open circuit voltage on the electrode to about 30 volts, but when the arc is struck the advantage of 75 volt open-circuit voltage is retained. Increased strength and protection for the welders are provided by newly designed steel housings. For complete details communicate with the company at any of its branch offices.

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In Imperial Oil's report for the year 1948 it is stated that the company found more crude, produced, transported, refined, distributed and marketed more oil and products than ever before.

Capital expenditures for plant and equipment totalled $46,591,937. Sales in Canada and Newfoundland were $1,819,-000,000 gallons. The Company's eight refineries processed an average of 136,027 barrels a day, an increase of 14.5 per cent over 1947. Major developments in manufacturing during the year were the completion of new refining units at Montreal East at a cost of about $22,-000,000 and of the first phase of a new oil refinery at Edmonton. An eight-inch pipe line was laid from Nisku to the Company's Edmonton refinery and considerable progress was made in planning for a 16-inch line which will be laid from Edmonton to Regina. Exploratory footage drilled in Alberta totalled 153,403 feet. One hundred and nineteen wells, of which three were dry holes, were drilled in the development of known fields.

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The number of firms to be represented at the 1949 Trade Fair in the machinery, engineering and plant equipment trade group has been given a sharp boost with the reservation of space by Engineering Industries Association representing 1,200 firms from the London region of England.

The firms are manufacturers of light and medium engineering products, tools and instruments. In addition to offering their products for sale at the Trade Fair, the association will investigate Canadian market requirements, price competition, saleability of their goods and report the findings to member firms.

Machinery and plant equipment firms from nine countries have reserved space at this time with this latest British entry placing that country at the top in number of firms represented.

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U.S. Secretary of Commerce, Charles Sawyer, requested the Advertising Council to discontinue its heavy steel scrap campaign, effective May 15, because of the improvement in the steel scrap supply situation.

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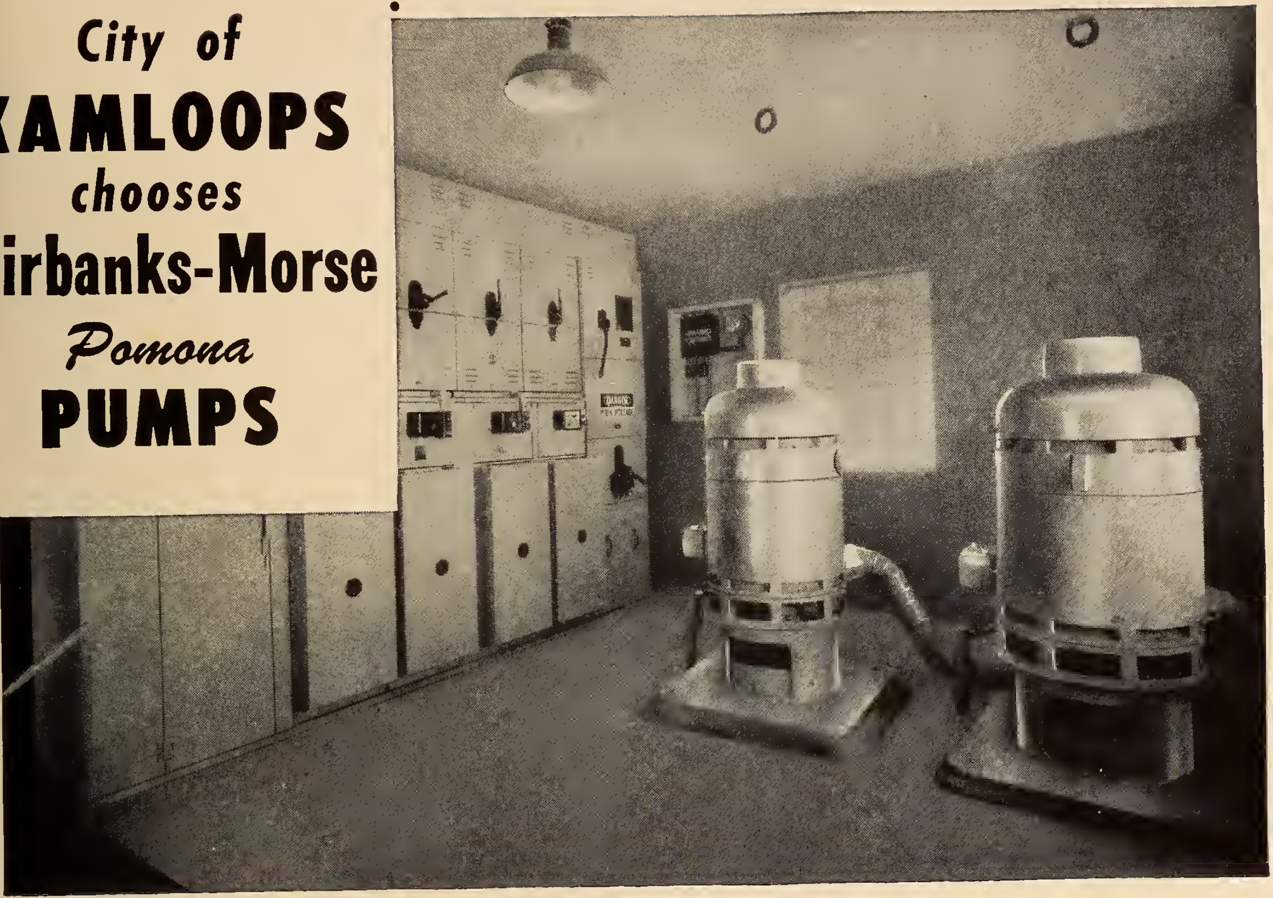
Intended for fast demolition work for use wherever footing is treacherous, a



Motor floor, showing 150 HP motors and control panels for deep-well installation of two Pomona Turbine Pumps operated by the City of Kamloops, B.C.

new paving breaker, weighing only 38 pounds, has been added to the Gardner-Denver line. For details communicate with the Company at Chicago or with its Canadian representatives.

•

It is claimed that a Canadian Westinghouse development will assist in saving the Ontario public upwards of $1,000,000 in connection with the Hydro frequency changeover programme. This development, a dual-frequency fluorescent lamp ballast, which can be economically produced, provides a simple means of switching and eliminates the necessity of altering and reconnecting the original wiring within a fluorescent lighting fixture. G. F. Mudgett and E. I. Morwick of the Westinghouse Lighting Division at Hamilton developed the new ballast which has been approved by the Canadian Standards Association.

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The first low-cost oxygen plant of commercially substantial tonnage output, to be built for the petro-chemical industries, has successfully passed all initial test runs, it was announced by E. A. Flaschar, general manager of the Stacey-Dresser Engineering Division of Dresser Industries, Inc. Installed in Winshire, Texas, as an integral part of a petro-chemical plant, recently completed by the McCarthy Chemical Company, the new oxygen unit is now producing more than the design quantity of 175 tons per day of 90-95 per cent pure oxygen which is delivered at 800 psig. For complete details communicate with the Director of Public Relations, Stacey-Dresser Engineering Division, 1900 Superior Aven., Cleveland, Ohio.

•

An industrial X-Ray service is available, at Canadian General Electric Company, which will provide inspection and report on the structure of metallic or non-metallic materials. The equipment will handle materials up to one inch in thickness and up to a maximum of 20″ by 30″ in outside dimensions. Standard size pictures are 8″ by 10″ or 14″ by 17″ with delivery of prints within two or three days of the time the parts for inspection are received. The cost of the service is four dollars for each satisfactory film; transportation charges are additional. Pieces to be X-rayed should be sent to the Works Laboratory, Davenport Works, Canadian General Electric Company, 940 Lansdowne Ave., Toronto. The covering order should be sent to the Company's Head Office, 212 King Street West, Toronto, marked for the attention of E. Rudge.

•

Lippmann Engineering Works of Milwaukee,—4603 W. Mitchell Street—Wisconsin, has expanded its production of equipment for pits, mines and quarries, and is ready to consolidate distribution in the Great Lakes region. Manufacturers' representatives interested in securing further details, with a view to acting as Lippmann representatives in Ontario, should communicate with the Company at the address given in this item.

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Arrangements have been made for Harold Wilson, president of the Board of Trade of Great Britain, to tour the Dominion. Mr. Wilson arrived in Canada on May 12th and after a tour of three weeks will be present at the opening of the Canadian International Trade Fair, Toronto.

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The world's lightest solid, a "plastic foam" that swells up when baked to 100 times its original volume, has been developed by the Westinghouse Electric Corporation. It is lighter than some gases. The chemist responsible for this new development is Robert F. Sterling. It is believed that the new plastic foam will be used to insulate such things as soft-drink coolers, pre-fabricated metal houses and aeroplanes.

•

A two million pound-inch torsion testing machine, which can accommodate a specimen four feet four inches in diameter and up to sixteen feet in length, has been proof tested at the Fritz engineering laboratory of the civil engineering department at Lehigh University. Designed to study the torsional behaviour of structural members such as plate and box girders, the testing machine is capable of handling full-sized bridge sections, twisting them through any desired angle. The machine itself is, approximately, nine feet high and 25 feet long with a gross weight of 15 tons and a centre line 46 inches above floor-level.

•

A curtain wall of cellular glass and concrete has been developed by the Pittsburgh Corning Corporation of Pittsburgh, Pa. "In erecting single or multi-storey buildings, this new concept lowers costs, reduces construction time, makes possible more usable floor space, and provides permanent insulation", according to a statement issued by the Company. The panels used consist of cellular glass insulation cores and concrete veneers made up into thin, flat sandwich walls. They have been fabricated in several practical sizes and thicknesses. The insulated wall panels are made in-the-flat in any practical size. The largest panels made, to date, measure 256 sq. ft. each. The popular thickness is six inches; 2-inch cellular glass core with 2-inch exterior and 2-inch interior veneers. This is less than half the thickness of the conventional masonry wall. Construction on which these new insulated panel walls have been used includes—the Service Center at Toronto the Hydro-Electric Power Commission of Ontario, the Plastic Factory of Canadian Industries Ltd., Shawinigan Falls, Que., and the Retail and Wholesale Office of Hobbs Glass Co., Ltd., Trois Rivieres, Que. Complete details may be obtained from the Company—Pittsburgh Corning Corporation, 307 Fourth Avenue, Pittsburgh, Pa.

•

A new improved vacuum-tube voltmeter for measuring voltage in electronic and other low-energy circuits where minimum current drain is desirable, is available from Canadian General Electric's meter and instrument section. Designated as Type AA-1, the instrument has a calibrated range of 0.001 volt to 300 volts at all frequencies from 10 cycles to 1.5 megacycles. It is also graduated in decibels covering a range of minus 52 to plus 52 from a reference level of 1 milliwatt at 600 ohms. Complete details may be obtained from any C.G.E. branch office.

•

Monsanto (Canada) Limited are now occupying their new offices located at the plant, 425 St. Patrick Street, Ville LaSalle, Montreal. The new two-storey and basement offices are in a modern building specially constructed to accommodate the expanding executive and office personnel. The new Montreal telephone number for the Company is Wellington (WE) 8421.

•

Authorization for the expansion of the Kingston-Ont., Nylon Plant of Canadian Industries Limited which will approximately double its production of nylon yarn and staple fibre has been given by the directors of Company. Plans are being made to proceed immediately with the necessary construction. Some 300 additional employees will be required when the plant is in full operation.

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A rain repellent for aircraft windscreens has been invented. It is now being manufactured and marketed by a Canadian company. This windscreen treatment is the result of seven years research by Dr. D. F. Stedman of the Division of Chemistry, National Research Council.

•

Development of a special Tower Loader attachment for discharging concrete batches to forms above ground level or into trucks has been announced by the Kwik-Mix Company of Port Washington, Wisconsin. The tower device can be fitted to either the model 11-S or 16-S mixers. Information and specifications on the Tower Loader may be obtained, from Construction Equipment Co. Ltd., Montreal.

•

Cast Iron Machine Bases, weighing 100-tons each, were powder-cut with ease to five smaller size pieces by the Illinois Equipment Co. of Chicago. The equipment used was Oxweld C-60 Oxy-Acetylene Cutting Blowpipe. This equipment is sold in Canada by Dominion Oxygen Company Ltd., 159 Bay Street, Toronto 1, Ont.

•

The governments of British Uganda and Egypt have launched a huge irrigation and electricity generation scheme. The project will make possible an increase in the cultivable area of Egypt from 5.9 million acres to about 7 million acres. In the Sudan the irrigable area will be increased from 862,000 acres to 2.5 million acres. The scheme will also reclaim thousands of swampy acres in southern Sudan, and provide electricity for the industrialization of the British protectorate of Uganda. The project compares in size with the Tennessee Valley Authority. The cost of the first stage, which is the construction of an enormous dam at the Owen Falls, to regulate the level and discharge of Lake Victoria into the White Nile, is estimated at the equivalent of $48 million. The Egyptian Government will contribute $16 million and the British Protectorate of Uganda $32 million. Six turbines, each with an output of 15,000 kilowatts, or 90,000 kilowatts in all, will be installed.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Copies of the following publications may be obtained from the International Nickel Co. of Canada Ltd., 25 King Street West, Toronto, Ont. The March issue of the "Corrosion Reporter". In an article in this issue is traced the history of phosphorus discovery and development and present day methods of manufacture and application. Also offered is a publication entitled "Mechanical Tubing as an Engineering Material". It is a summary of information on nickel and nickel alloy tubing as well as other tubing in materials such as steel, stainless steel, copper and aluminum.

•

Spielman Agencies, Ltd., 420 Lagauchetiere Street West, Montreal 1, Quebec, offer a new four-page folder which contains, in handy reference form, Portland cement concrete, stucco, plaster and mortar waterproofing specifications. These abridged specifications have been reduced from the twenty-page Kerner-Greenwood Waterproofing booklet. There is no charge for the publication.

•

Copies of "J.I.C. Hydraulic Standards for Industrial Equipment" are offered by Miller Motor Company of Chicago. The entire "Standards"—as compiled and approved by the six cooperating groups of the Joint Industry Conference under direct sponsorship of leading automotive and industrial manufacturers, are reproduced word-for-word in this sixteen-page eight and a half by eleven booklet. The address of the Miller Motor Company is 4027 N. Kedzie Ave., Chicago 18, Ill.

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The Bristol Company of Canada Ltd., 71-79 Duchess St., Toronto, 2, Ont., offers Bulletin No. P-1239 which covers Bristol Diesel Engine Pyrometers. This 12-page, two-colour, bulletin is attractively designed and most informative.

•

"Surveys from the Air" is the title of a 28-page, four-colour brochure which may be obtained from the Photographic Survey Company Ltd., 1450 O'Connor Drive, Toronto, Ont. The brochure describes many types of photographic survey work with emphasis on the methods used and the results obtained.

•

Surface Combustion Corporation, Toledo 1, Ohio, has just released a two-colour bulletin showing the application of "Surface" burners to typical immersion heating installations. Both suction and atmospheric type burners are described and details are given for the use of the equipment in such jobs as interrupted quenching, rust-proofing processes, cleaning diesel motor blocks, and the removal of scale from cast metal parts. Ask for bulletin SC-142.

•

Brown, Boveri (Canada) Limited, 1111 Beaver Hall Hill, Montreal 1, have available copies of an interesting publication describing the Company's Isotherm Turbo-Compressor. The pamphlet is well written and illustrated. Ask for Publication 1629-E.

•

The Canadian Fairbanks Morse Company Ltd., 990 St. Antoine Street, Montreal, has produced a twenty-four page publication entitled "A Half Century of Progress". This interesting history deals with the progress of the Company since its founding in Montreal in 1898. Illustrations of the Company's plans and offices are shown and descriptions are given. For copies communicate with the Company, attention Mr. John O. Pitt.

•

"The Bepco Journal" published by Bepco Canada Limited, 4018 St. Catherine St. W., Montreal 6, Que., is available to readers of the "Journal". The April, 1949, issue contains an article on a-c generators as manufactured at the Bruce Peebles Works. There is no charge for this monthly publication.

•

The April issue of the "C.I.L. Oval" contains an interesting article entitled "Soil—and Survival". For copies of the publication communicate with the Department of Public Relations, Canadian Industries Limited, New Birks Bldg., Phillips Square, Montreal.

"Dominion Oxygen Tips" is the title of a monthly publication produced by the Dominion Oxygen Co. Ltd. This Company magazine should be most interesting and helpful to the engineer who is interested in welding. It is well written and illustrated. To be placed on the mailing list communicate with the Company at 159 Bay Street, Toronto 1, Ont.

Appointments and Transfers

The Department of Trade & Commerce has announced the appointment of Douglas Arthur Jones of Hamilton, Ont., as Federal steel controller. He suceeds F. K. Ashbaugh.

Mr. Jones was formerly with the Steel Company of Canada at Hamilton. He joined the Department about three years ago.

•

G. Sahovaler has been appointed Canadian representative of the Ateliers Ferret-Goglio, French manufacturers of cemented carbide which is branded by the name of "Diametal". Mr. Sahovaler, formerly a resident of Paris, France, is a graduate of McGill University. His office is located in suites 412-13, Castle Bldg., St. Catherine St. W., Montreal.

•

R. J. Ker has been appointed manager of the air conditioning division, Montreal district office, Canadian General Electric Co. Ltd.

Mr. Ker has had wide experience in connection with the air conditioning industry. He is a native of Windsor, Ont. He was educated at Kennedy Collegiate and at the University of Detroit. He joined C.G.E. in 1935 and has been in the Montreal sales and engineering departments since 1941. He is a member of the American Society of Heating and Ventilating Engineers and the Refrigeration Service Engineers Society.

•

H. Clark Minns has been appointed supervising engineer in charge of the mechanical section and general industrial and installation work of Blenkhorn & Sawle Ltd. of Niagara Falls and St. Catharines, Ont.

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CONTENTS

12,550 copies of this issue printed

COVER PICTURE

This month's cover shows a unique gathering of international delegates to the 1949 Annual Meeting and the first Hemisphere Conference of the International Committee of Scientific Management (CIOS).

From left to right, they are:—E.I.C. President J. N. Finlayson, Vancouver; Jacques Greber, Paris, France, consultant to the National Capital Planning Committee; Dr. Lillian Gilbreth, Montclair, N.J., president, Gilbreth Inc., consulting management engineers; Dr. Hugo de Haan, Geneva, Switzerland, secretary general of CIOS; Miss Elsie MacGill, Toronto, consulting aeronautical engineer; J. Edgar Dion, Montreal, chairman of the Conference programme committee; C. A. Peachey, Montreal, chairman of the Canadian Management Council; Dr. M. E. Alvaro, Rio de Janeiro, president, Brazilian Institute of Scientific Management (IDORT); and S. John Wright, London, England, member of the British Agricultural Engineering Mission to Canada.

Mr. Greber is pointing out to the group some of the features of the plan for Canada's national capital at Ottawa.

PHOTO-INTERPRETATION of TRANSPORTED SOIL MATERIALS

This paper was presented to the Regina and Saskatoon Sections of the Saskatchewan Branch of the Engineering Institute of Canada in November 1947 and January 1948 and merited for the author the Keefer Medal of the Institute for 1948.

by

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The identification of wind, water, and ice transported deposits by means of airphoto interpretation techniques is introduced in this paper to supplement existing methods of mapping and evaluating soil materials. The interpretation and analyses of certain elements which form airphoto soil patterns are described in some detail. Geological deposits discussed and illustrated are kames and eskers, sand dunes, alluvium, moraines, glacial lakebeds and loess (wind-blown silt). The application of photo-interpretation to engineering problems is also given.

Before the civil engineer is able properly to design certain types of outdoor projects he has first to select a favourable site. This selection can be made quickly and economically with the help of aerial photographs, once the interpreter has acquired a technique for identifying surface geological materials, since he has the advantage of viewing landscape patterns of large areas at one time, far beyond the horizon of the observer on the ground. The trained observer soon develops a capacity for recognizing the manifold landform patterns, such as sand dunes, eskers (gravel ridges) or glacial lakebeds.

Photo-interpretation finds application in many branches of engineering and science. Foremost among these are natural resources surveys, soil mapping, right-of-way selection, drainage mapping, forest mapping and contract planning. In order to realize the most good from the material set forth in this paper, there must necessarily be a blending of the knowledge and perspective of the engineer, the geologist and the soil scientist.

Application of Photo-Interpretation

Natural Resources Surveys

Inasmuch as certain ore deposits are related to geomorphic processes[1] and history; folds, faults, dykes, veins, and other similar structures are identifiable. ⑰ [2] When these structures are localized, a trained geologist can quickly determine the prospecting possibilities of such a "find." Occasionally vestiges of tilted strata from dome remnants appear in the photos, usually in areas where the bedrock has no appreciable soil cover. This type of information will often narrow the amount of field exploration in potential oil localities.

Lately much interest has been evinced from those quarters of geology concerned with the mapping of contacts between fundamental rock types. Wherever this procedure is used it should be followed by field checks. Also, all pertinent geological maps should be kept close at hand. They will testify to the skill of the interpreter and method of map production.

One organization in Western Canada has used the photographs to locate swamp and bog areas for the propagation of muskrats. The observer is able to limit field work by studying present and past drainage courses in areas virtually inaccessible by land transportation. Maps can be drawn to show the kind, character, and distribution of natural forests so that preliminary quantity estimates can be made. In northern latitudes a system of forest classification such as this provides a liaison between sound management of timbered regions and other contingent resources — notably, water, range, recreation, and wild life.

Soil Mapping

In Western Canada soil materials are mapped primarily for two

[1] Geomorphology: The study of landforms—surface features on the earth's crust ②.

[2] Numerals circled, thus: ⑰, refer to corresponding items in the Bibliography at the end of the paper.

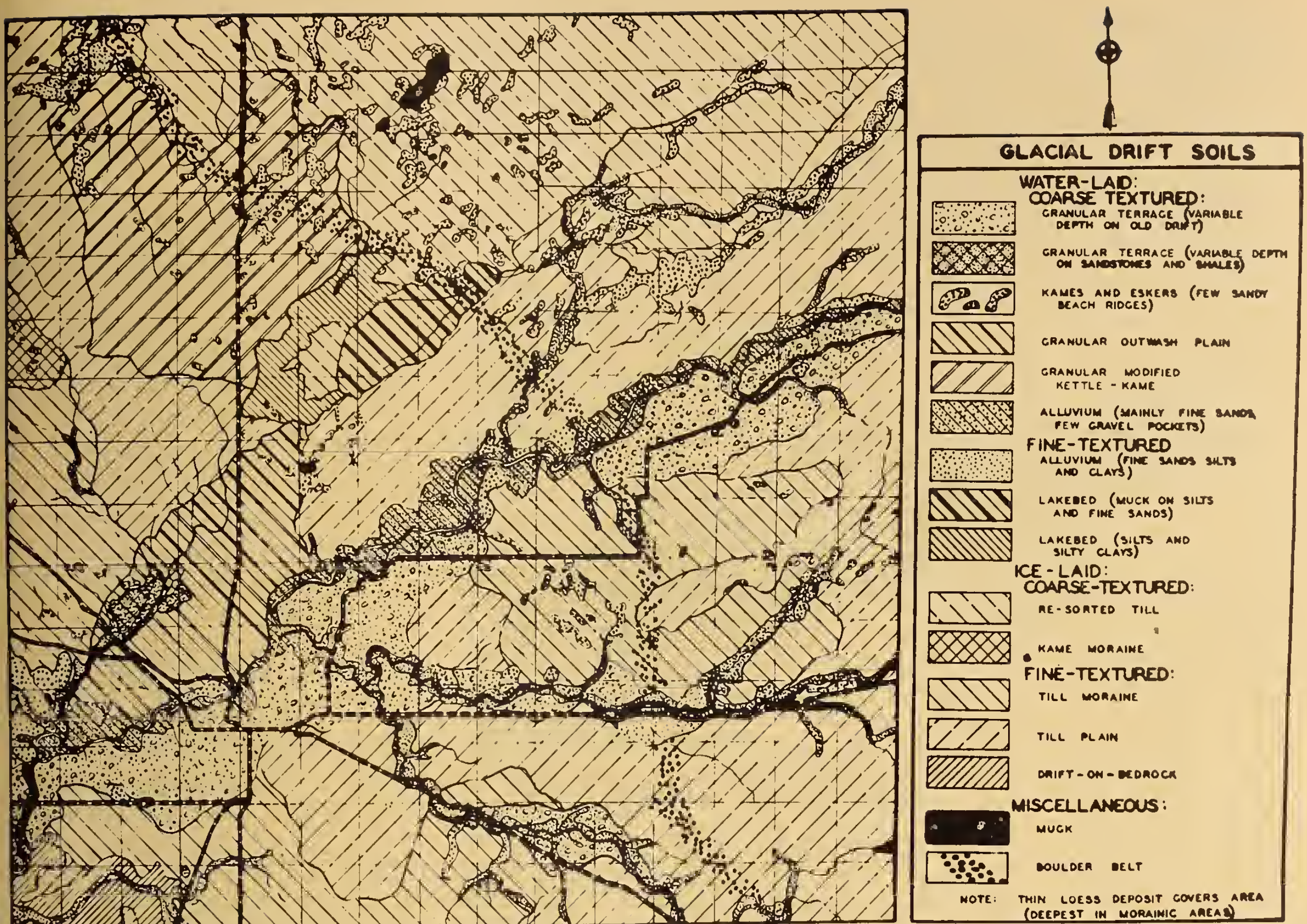


Fig. 1. Soil map. A reproduction of part of a regional soil parent material map. Such a map usually will require some translation before it can be used to the best advantage.

purposes: a) to determine their relative ability to produce plant life; and b) to determine their relative suitability as construction materials. Fundamentally, both of these adopt a system of soil classification which is related to the fields of applied geomorphology and applied pedology.[3] The product of these landform and soil forming processes results in a characteristic soil pattern on the photograph.

In sum, the following indicate where phototechniques can be profitably applied to soil investigations; soil classification (engineering, geological, agricultural); highway and airport site selection; dam site and canal location; and location of granular borrow materials. A soil map prepared from airphotos for engineering purposes is reproduced in Figure 1.

Drainage Mapping

A significant application of airphotos concerns the mapping of drainage systems and basins. These maps will serve as a source of useful data for reconnaissance surveys in highway and airport location, water development projects, and flood control. Information regarding watershed areas and conditions affecting runoff can be included on these maps. (See Figure 2.)

Contract Planning

It has been found that aerial photographs lend themselves well to certain types of contract planning. Interpretation of aerial photographs in the earliest reconnaissance stages may save weeks of tedious and expensive field investigation. In regions where dam sites are proposed, it is a good idea to construct a mosaic[4] of the surrounding area, including several miles of reach of the river. In this way the shortest cross-section of the river can be selected readily, as well as surface features that may be desirable to spillway and tunnel location. The area should also be carefully investigated for the presence of faults, landslides, and even lesser movements. In the photos, landslides are revealed by long, curved arcs accompanied by vertical displacements, or by a series of slump blocks along the side of a steep slope. The location of bedrock outcrops in glaciated regions can also be detected by close examination of the aerial photographs.

Use of Stereovision[5]

Stereoscopic coverage permits the interpreter to determine relative slope and relative relief. For stereoscopic examination one photograph is laid on top of, and partly overlapping, the adjacent print, with the distance of separation of the same point on adjoining photos approximately 2¼ inches. When the photos have been adjusted,

[3] The science that treats of soils in their natural state (8).

[4] A composite picture made by matching together contact prints, so that a large area can be seen at one time.

[5] The application of binocular vision which enables the observer to view two different perspectives of an object and to obtain from them a mental impression of the third dimension.

Fig. 2. Drainage map. Use of the drainage map for computing watershed areas in rough terrain. This map has been prepared from aerial photographs.

centre a stereoscope over them to obtain an optical reception of the third, or vertical, dimension. Frequently, when photographs are viewed stereoptically for the first time the observer will have some difficulty in "getting" the relief. With practice, however, it is possible to view matched pairs stereoptically with the naked eye.

Good quality prints are a prerequisite. Several factors influence the clarity of soil patterns on the airphoto, namely: a) the season of the year in which the photos were taken; b) the time of the day at which the exposure was made; and c) the weather conditions prior to taking the photos.

Elements of Airphoto Identification of Soil Areas

The technique of identification of engineering soil areas from aerial photographs is acquired by a careful study of all elements which compose what is termed "the soil pattern." It is pertinent to mention briefly what is meant by "soil pattern". To the untrained observer an examination of the photograph reveals little, yet to the trained observer a soil pattern is apparent.

This pattern is the result of natural and human forces acting on the original material from which the soil was derived. The elements that make up the soil pattern are visible features which are largely the result of relief and chemical and physical properties of the soil profile.[6] To translate these elements, or tools of interpretation, intelligently the observer should have an understanding of the basic principles underlying climatology, geology, pedology, and ecology.[7]

[6] The series of layers in any given soil is designated as its profile and its characteristics are made up of the sum total of the layers of its profile (8).

[7] The study of plants with reference to their environment and factors that control their distribution.

The elements which contribute most toward the formation of soil patterns are the landform, soil position, soil colour, erosion, surface drainage, vegetation, land-use, and man-made features. See Charts I and II, Figure 3.

Landform (Parent Material)

The local physical structure of the surface of the earth is called the "landform." It is, in fact, to most people the landscape. In bedrock areas the origin and composition of the parent rock will largely determine weathering characteristics and, therefore, the landform. Similarly, sand dunes and loess possess a physical appearance that has been shaped by the wind, and is distinguishable by a directional trend.

Soil Position

When identifying landforms in the photograph, cross - sectional sketches of the terrain should be drawn with the view of estimating relative slope and relative relief. In general, a good deal of information can be read from the position of the soil relative to neighbouring local relief. That is to say, the soils on the top of a hill may be vastly different from those in a nearby slough, which may be injuriously high in alkali content or in organic matter because of slightly different vegetative and moisture conditions.

Soil Colour

Soil colours are important; although the observer must be careful not to confuse soil colour and colour caused by plant growth (Fig. 4, upper). The relative amounts of light and dark areas are important—especially in glaciated regions. Muck (decomposed plant matter) will photograph black; shifting sand dunes, pure white; and moraines, mottled light and dark grey. The latter is due to the thin, dark surface layer on the hills, which, as a result of cultivation, permits the subjacent white limy soils to be ploughed to the surface. In the depressions the top soil is usually too thick for this condition to occur. The hills are usually dry, whereas moisture tends to accumulate and darken the soil colour in the depressions.

Erosion

The erosion shapes of gully systems reveal certain properties of the soil profile (Fig. 4, lower). Under normal conditions gravel gullies will assume a V-shape; pure

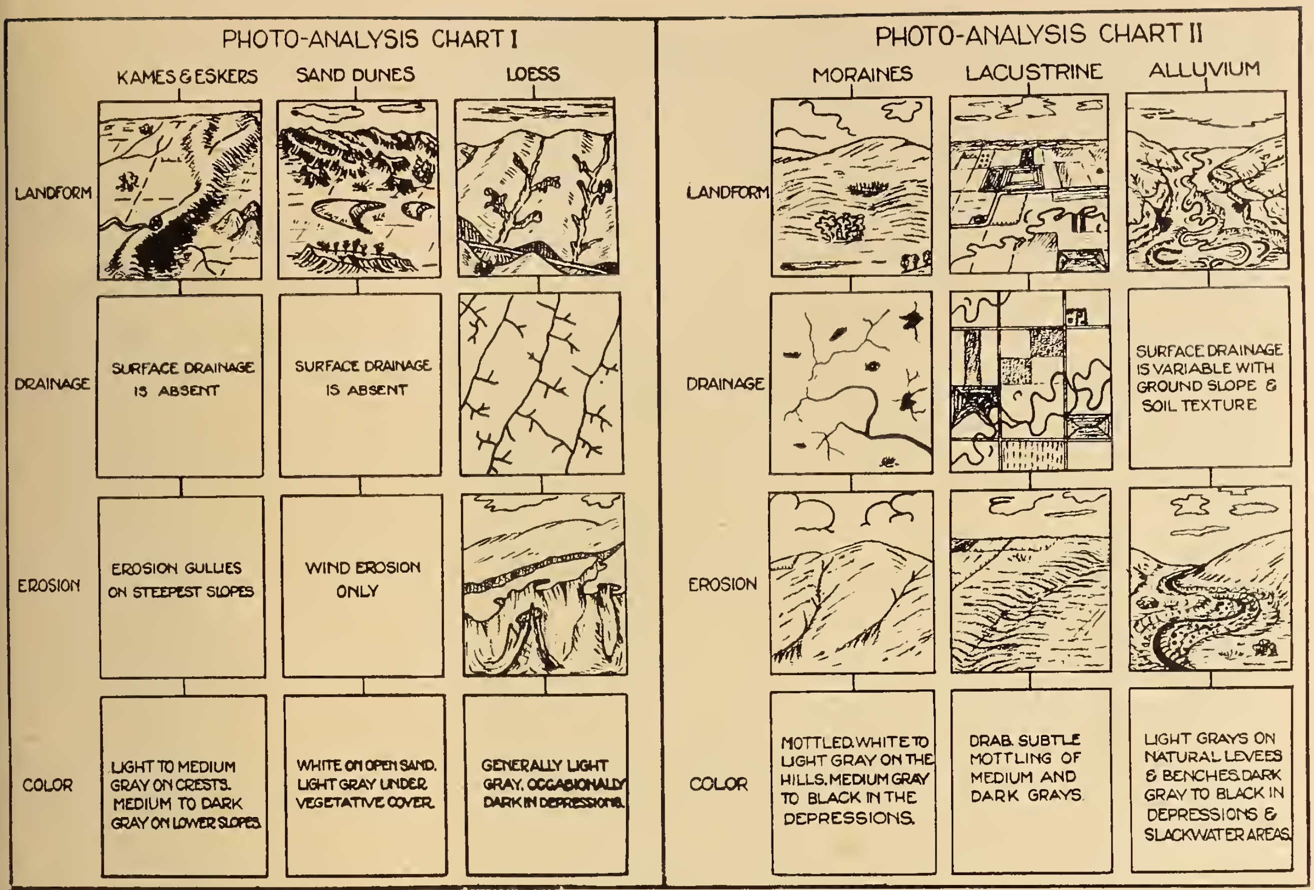


Fig. 3.

silt, a U-shape; and clays, a smooth, softly rounded form. Gully cross-sections should be drawn wherever possible to ascertain textural (grain-size), and plasticity characteristics. At the same time the interpreter should analyze the cause of gully formation and so determine its importance, since gully cross-section is a function of the climate, soil porosity, and ground slope.

Surface Drainage

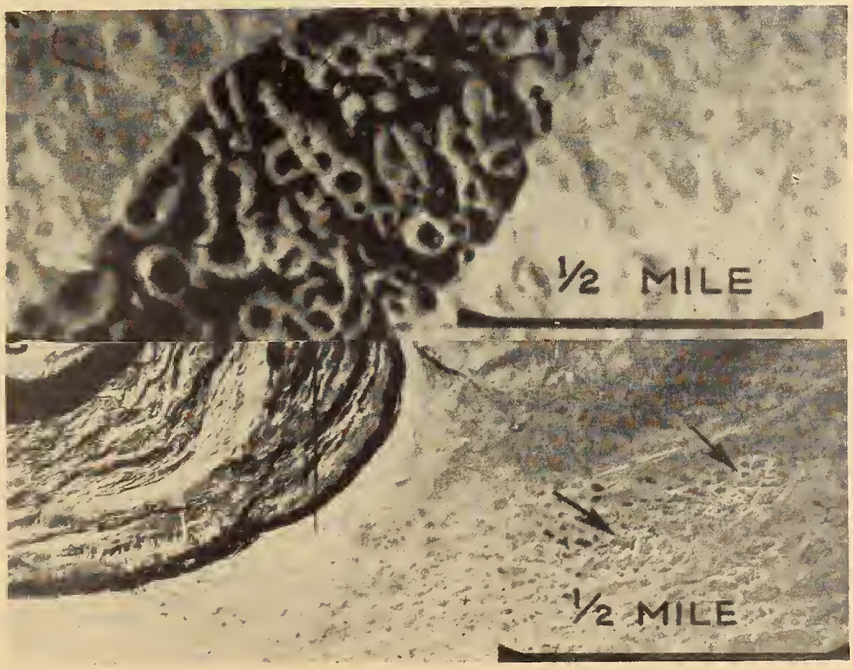
Obviously the more developed and intricate the surface drainage pattern, the more likely it is that the subsoil is impervious. Depending upon topographic position, sandy and gravelly soils show a lack of surface drainage. On the other hand, on gentle slopes, silts, clays, and silty clays tend to erode rapidly. In bedrock areas a trellis drainage pattern is a reliable indicator of tilted or folded rock, while a radial drainage pattern accompanies igneous intrusions and volcanic cinder cones.

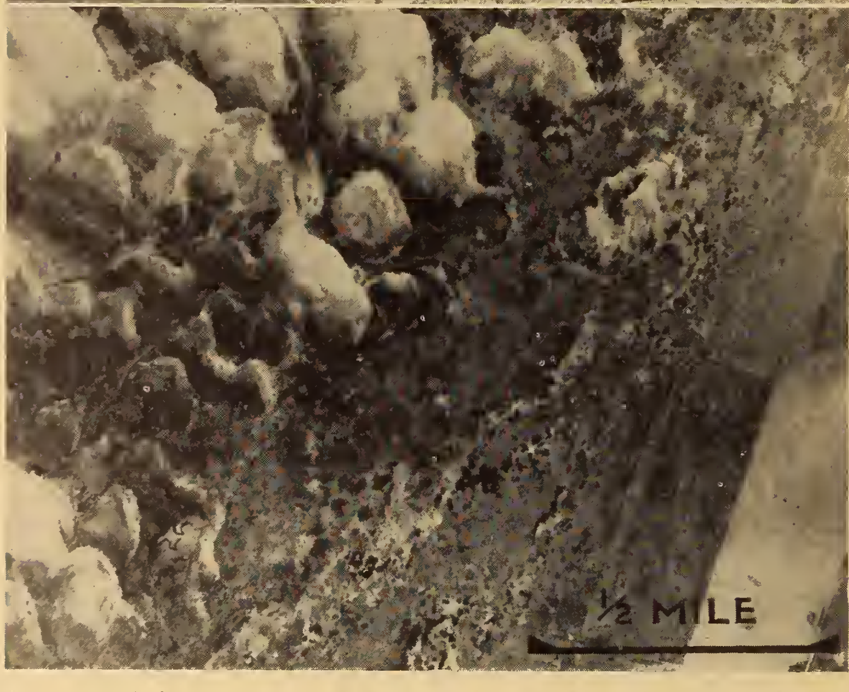
Vegetative Cover

Very often vegetable cover is the chief airphoto element in soil areas covered by dense forest. One commonly used procedure to identify soils under these conditions is local correlation between soils and vegetative types, and then between these types of vegetation and colour tones in the airphoto. In addition, the observer should

Fig. 4 (upper) Soil colour. The relation between relief and soil colour tone is shown in this illustration. A prairie fire (left) accentuates white circular rings, which follow along the crests of these sharp knolls. The dark centres of these rings represent slight depressions in the top of the knolls.

(Lower). Erosion. Intense weathering has deeply dissected these thinly stratified beds of sandstone and shale. Wind has shifted sand from the flood plains to the upland area (arrows).





(Upper) Fig. 5, Esker. In this excellent illustration, the proximity of the esker, *A*, to the drainage channel, *B*, suggests that the deposit was probably formed by a subglacial stream flowing along the valley bottom.

(Lower) Fig. 6. Sand Dunes. An air view of shifting sand dunes along the Alberta-Saskatchewan boundary. These dunes have been formed by wind rolling fine sands along the bottom of an old lakebed.

be familiar with the influence that photographic processes have upon colour tones recorded by the many types of forest foliage. Usually a good deal of experience is necessary to distinguish soil types from vegetative cover.

Land-use

Coupled with the part which nature has played in forming soil patterns is the important role of man in his agricultural and industrial development of the land. An excellent example is the so-called "dead" furrow, which the farmer uses to drain his land. Here the interpreter deduces that the land is poorly drained, and accordingly impervious. Strip farming is another example where the farmer is required to till his land in long, narrow strips to prevent soil drifting. This procedure has been adopted in many light soil areas in southern Alberta and Saskatchewan. Along several rivers in British Columbia the regular dotted pattern of orchard fields suggests good subdrainage. These soils are mainly sands and sandy loams which have been transported there by water.

Engineering Pedology

Some elements of the soil pattern may be altered by changes in climate, but others will remain the same for a given soil profile regardless of geographical location (12). The chief reason that subtle variations often exist is due to climate, which affects the type and amount of vegetative cover and the intensity of soil colour. Fortunately, in instances where some of the elements are unreliable, a proper evaluation of the remaining elements will usually give some clue to the soil type shown on the airphotos.

Just as like soil profiles give similar airphoto patterns, the converse is also true: that wherever soil patterns are duplicated, similar geological and pedological conditions have prevailed. This is understandable since the physical properties of the soil are related to geological and pedological processes of soil formation. An excellent illustration is the large Regina glacial lakebed in Southern Saskatchewan.

This basic premise is summarized in Technical Development Report No. 52, Civil Aeronautics Administration, Washington, D.C., (9), from which is quoted, in part:

> Soils are products of nature upon which they are almost wholly dependent for their formation, distribution, and physical and chemical characteristics. Therefore, in their natural states, soils are subject to analyses and interpretation based on natural processes. Thus, if the knowledge is available of the original material from which a soil was formed and of the conditions to which it was exposed, general information concerning the resulting soil is immediately derivable.
>
> In addition, available detailed data for one soil may be applied in general to a second soil that originated and developed under the same conditions as the first. This is the fundamental hypothesis. . . . It holds true for all geological forma-

tions, whether they be of bedrock or of transported material moved by wind, water, or ice.

It further states: " Although the process of soil formation follows this basic principle, the soil mantle is more complex than these statements might indicate." This last statement is significant since the soil mantle in many instances has been complicated by many different geologic processes. Therefore, it is essential that the interpreter be constantly aware of the limitations and accuracy of his work.

Soils of Glacial Drift Areas

With the exception of the high mountainous regions in Canada, there are only a few isolated areas which have not been profoundly affected by the Pleistocene continental glaciers. Although this material is usually heterogeneous in composition and variable in depth, it may, depending on its mode of deposition, be remarkably uniform in composition and depth — for example, sand dunes and lacustrine (glacial lakebed) silts and clays.

Since the recession of the last ice sheet the processes of soil formation have altered the original surface materials to form layers, or horizons, varying considerably in chemical and physical properties. These different soil horizons result from the effect of such environmental factors as climate, vegetation, micro-organisms, drainage, relief, and time (soil maturity), acting upon the original surface geological deposits. By correlating glacial landforms and their associated soil profiles with airphoto patterns it is possible to identify soils for engineering and agricultural purposes.

Eskers and Kames

The exact method of formation of eskers and kames has not been definitely determined except that they were formed by glacial streams either on, within, or under the ice sheet. In the airphotos, eskers appear like abandoned railway grades, except that they are less symmetrical and not so straight (see Fig. 5). Other identifying elements of kames and eskers are their incongruity with the surrounding landscape; light colour tones along their crests; and frequent dark tones around their bases.

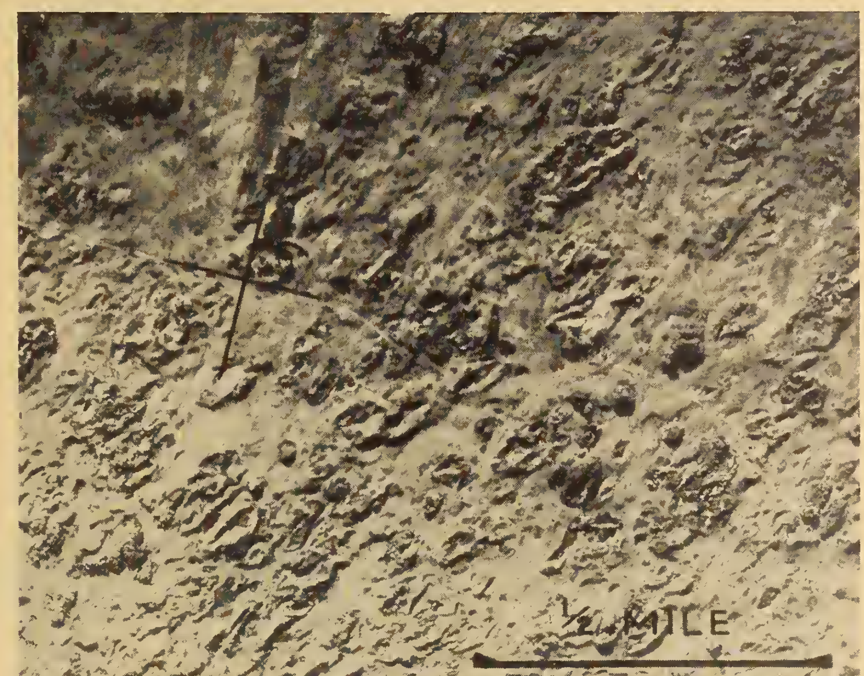
The granular material found in these forms is important wherever aggregates are needed for construction purposes. When investigating these deposits as borrow material, it is best to begin excavation near the crest of the ridge, since at this point the top soil will be at a minimum. It is also advisable to work against an open face, thereby mixing the fine sands and gravels as they cleave from the walls of the gravel pits.

Sand Dunes

The crescent-shaped sand dune is one of the most easily recognized of all landforms. This particular type of dune is gradually built up by small supplies of sand and moderate winds (3). The usefulness of dune sand for engineering purposes has been established. In highway

(Upper) Fig. 7. Sand Dunes. The double crested dunes shown here are typical of many areas in Southern Saskatchewan. The steep side of these dunes (away from the prevailing wind) has a slope of about 35 degrees with the horizontal, which is the angle of repose for material of this size.

(Lower) Fig. 8. Alluvium. A photograph of the alluvial flood plain along the Assiniboine River. Current markings are plainly visible along the inside bends of this river. Wind action has moved fine sand from the plains of the upland to form small dunes (arrows).



and airport construction they are excellent sources of borrow for base courses, and as a subgrade material they are among the best (9). Small amounts are also being used to obtain desired aggregate gradation in concrete work. Groundwater supplies frequently occur at depths less than 20 feet in duned areas of Saskatchewan. Inasmuch as these deposits exhibit a marked lack of drought resistance, have a tendency to erode easily, and have a high silica content, they are low in plant nutrient elements and have little value from an agricultural standpoint.

Alluvium

Deposits which have been transported by running water are called "alluvial." In Western Canada these soils are usually found along present-day drainage courses, although deltaic deposits are to be found in many upland areas.

The large volume of water that flowed down these stream channels has left its tell-tale current markings. These marks (see Fig. 8) are easily recognized in the airphoto. Intense current action has carved wide, parallel, circular markings, variously termed "sweeps," "scars," or "scrolls," which follow the downstream trend of the river channel. When viewed stereoptically, the relief of alluvial plains may appear level or benched, depending on the amount of water at the time of deposition. When these soils are well-drained and light in texture, they are reflected in the photo by light grey soil colours (Fig. 8).

These deposits are a convenient borrow material for the outer portion of impervious core type, earth-fill dams. Coarse alluvial soils serve as an excellent subgrade for highways and airports, provided that their relative topographic position renders them free of inundation by spring floods. Seepage will often be a limiting factor in areas where canals or similar construction is proposed. Their flat topography and pervious nature make them among the most suitable soils for irrigation.

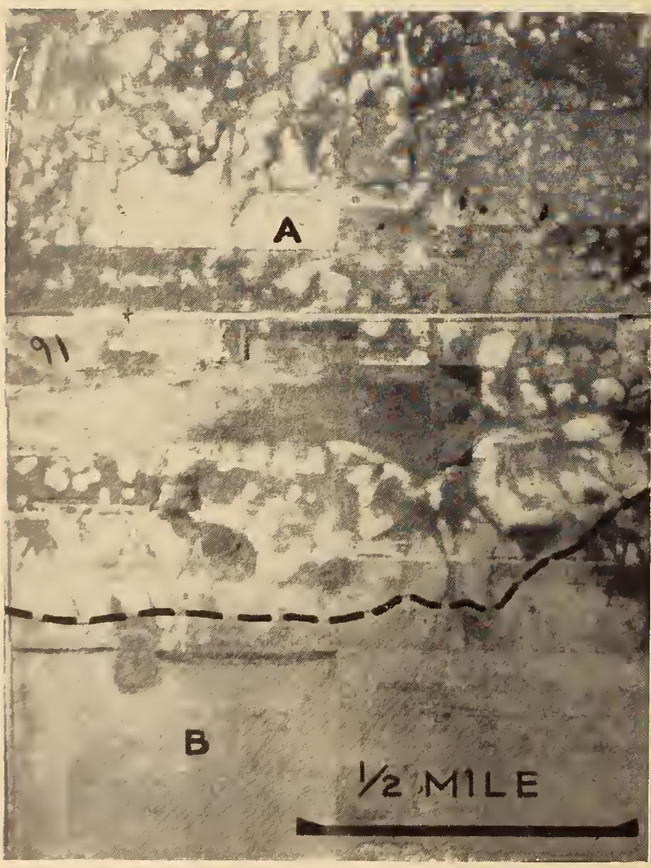
Moraines

It is believed that moraines were formed during the time when the ice front was at a temporary halt, either when the ice was at its maximum advance, forming a terminal moraine — or during its recession, giving rise to the so-called recessional moraine. The textural composition found in this accumulation of drift is a function of the condition which existed when the debris was being deposited. A plausible explanation for stratified drift common in some moraines, is that the stagnant ice possessed a system of intersecting cracks and crevasses, the material in these fillings being left as roughly sorted knobs of silt, sand, and gravel when the ice completely melted. When these knobs are numerous, steep-sided and coarse in texture the landform is called "kettle-kame moraine."

The engineering problems in a kettle-kame landform are several. For instance, if a dam were constructed in such an area, little or

(Left) Fig. 9. Moraine and Glacial Lakebed. The two soil patterns shown here can be distinguished without the aid of stereovision. Differences in parent material and topography are largely responsible for the change in airphoto pattern. *A* is mapped as undifferentiated glacial till; *B* as lakebed heavy clay.

(Right) Fig. 10. Lakebed Soils. The absence of soil colour mottling is due to flat topography, uniform soil textures and uniform profile development. By sample and test, the soil properties of this lakebed are uniform. Soils on this particular lakebed exhibit abnormally high volume change and liquid and plastic limits.



no runoff would be expected to reach the river. Ground-water supplies are favourable, since water will be found entrapped in sand and gravel lenses. Although borrow materials are available, the hilly terrain is not suitable to highway or airport construction. Farm lands will be correspondingly poor in these vicinities because of the rough topography, high losses of moisture by rapid runoff, and high proportion of wasteland caused by wet depressions ⑩.

Glacial Lakebed Soils

Lakebed soils are created where the land in front of the glacier slopes toward the ice, thereby damming the water derived from the melting ice. The high density of the still water in marginal glacial lakes, produced by cold climates, retarded the settling of silts and clays, thus causing them to become diffused and to filter slowly to the bottom.

The landscape associated with lacustrine soils is one of the most level of all geomorphic forms. Because of this, and since the soils are uniform in texture, the lakebed pattern is easily discerned in the photos. Uniform soil colour tones, flat terrain, and rectangular field and highway patterns are the principal airphoto elements (Fig. 10). Gully banks, because they are related to the origin of the soil, assume softly rounded shapes; gully systems have low gradients and are characterized by aimless meanders.

Glacial lakebed deposits cover several thousand square miles in Western Canada, ①, and are highly important both from an agricultural and engineering standpoint. They present some of the best wheat growing soils in the country as well as some of the most adverse soils upon which to build. The heavy soil hinders road and airport construction during wet weather, because of its ability to retain moisture by capillary action.

Loessial Soils

The origin of loessial deposits is attributed to the violent wind storms which transported silt particles in suspension from the dried-up flood plains of large rivers — the Mississippi and the Missouri, for example—to the upland, and from desert areas such as those found in northern Africa and central Asia.

Fig. 11. Loess. The erosion pattern of windblown silt in humid continental climates is shown by this photo. The "fishbone" drainage system, seen in this picture, is more fully developed than in other loess deposits in North America.

Loessial soils can be detected in the airphotos by their uniformity of gully pattern regardless of climate or geographic location. Their gully systems have the semblance of a "fishbone," with long, straight channels representing a backbone, and short, right-angle tributaries resembling ribs (Fig. 11). Vegetation is the main variable of this pattern. The other chief identifying elements are the strong parallelism of elongated hills and drainage systems, the mohair-like surface appearance and excessive erosion in areas of moderate to heavy rainfall.

Conclusions

In a paper of this kind definite limitations must properly be imposed. As a result, only a few wind, water, and ice transported soils were chosen to demonstrate the adaptability of photo-techniques to engineering and agricultural problems. To accomplish this end one and sometimes two pictures were used to illustrate each landform. To describe each landform, its variation and airphoto elements, adequately, would require numerous airphoto illustrations and supporting ground views, and is therefore beyond the scope of this paper.

The general method of approach and airphoto interpretation techniques set forth apply equally well to bedrock areas, regardless of whether they are volcanic, igneous, metamorphic or sedimentary in origin. The same holds true for both residual and non-soil localities.

By way of conclusion it should be emphasized that the interpretation of other standard patterns requires constant field checking. If this is done, the observer will quickly learn the potentialities and limitations of his work. As the degree of refinement increases, the whole process becomes more and more dependent upon the experience of the interpreter.

Acknowledgments

The writer wishes to express his appreciation to G. L. MacKenzie, chief engineer, G. W. Parkinson, design engineer, and R. O. Peterson, soil mechanics engineer, all of the P.F.R.A.; and to H. G. Dion, associate professor of soils, University of Saskatchewan; and H. C. Moss, soil specialist, Dominion Department of Agriculture, Saskatoon, Saskatchewan, who read the manuscript and offered helpful suggestions.

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Discussion

F. C. Brownridge[1]

The section dealing with "Use of Stereovision" might be amplified. The purpose for which the prints are intended will enter into the choice of print required. Where contrast is an important feature a double weight glossy paper will give better results. If topographic features or boundaries are to be outlined, double weight semi-matt print may be preferable, due to the ease with which they may be marked. Some experiments have also been tried with "transparencies"; that is, the positive photograph reproduced on film. When these are viewed with the aid of a lighted background, detail in shadows, not visible in regular prints, may be seen fairly clearly.

The section on "Engineering Pedology" is possibly the most important part of the paper, and should be thoroughly understood to appreciate the methods used in airphoto analysis. The principles, upon which the whole system of interpretation is built, are fully explained. The origin, description, interpretation and engineering significance of the selected land forms are given in some detail. From experience in checking a large number of eskers and kames on the ground, and examining many airphotos of Ontario, there are additional features which are felt to be important.

In the case of eskers, which are more or less continuous, there is usually associated with them a depression which might be termed an "esker trough". This depression which is adjacent to and parallel with the esker, may take the form of either a watercourse, a series of elongated lakes or ponds, or may simply be low, swampy land. This is because eskers have a directional trend the same as that of the glacial movement, and not always the same as the slope of the land surface. Thus in many cases the esker forms a barrier and changes the direction of stream flow to one parallel with it. The kettle lakes or ponds seen in many photos, forming a chain parallel with the esker, may be due to blocks of ice separated and left at about the same stage of melting as that in which the esker was formed. Both eskers and kames are used extensively as sources of granular materials. The grading of the material in the case of eskers is more consistent and of a coarser nature, usually ideal for crushing for road work. Kames show more variation in bedding, with layers of fine sand, silty loam or clay loam, usually much finer in grading throughout.

As a verification of the principle that "the land form is the indicator for the parent material" it may be interesting to refer to an investigation now under way in connection with drumlins, which are not mentioned in the paper. These symmetrical cigar-shaped hills associated with many till plains are much more readily recognized and identified from airphotos than on the ground. Samples of the parent material taken from over one hundred drumlins in south-western Ontario show a close textural relationship usually classified as a compact and stony sandy loam, loam or clay loam. The percentage of sand, silt and clay varies within narrow limits. The profile development is comparatively shallow, with the material of the "B" horizon, usually a medium dark brown colour, classified as light clay or clay loam. The drumlin material is definitely related to the source from which the soils were transported and exhibits a corresponding chemical variation.

Applications

It may be pertinent to mention the use which is being made of airphotos by the Province of Ontario. The Department of Lands and Forests is engaged in a five-year programme of photographing, mapping and timber typing an area of 180,000 square miles of northern Ontario and the forested part of southern Ontario. The purpose is to determine the forest resources of the Province. The negatives and prints are an average scale of 1,320 feet to one inch, and are used in conjunction with geodetic and intermediate ground control to produce planimetric maps by the slotted template method. From glossy double-weight prints of the photos timber typing of the forested areas is being carried out and substantiated by repeated ground checks. From the survey an estimate of available timber may be obtained.

The Surveys Branch of the Department of Highways has been

(Continued on page 347)

[1] Soils Branch, Dept. of Highways, Prov. of Ontario.

ATTITUDE and EDUCATION

by

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Reprinted from the Journal of the American Society for Engineering Education, December issue, 1948

Introduction

My subject is Attitude and Education. My thesis, a simple one, is first that the prime purpose of education is to inculcate healthy attitudes; second that choice of subjects or curriculum has little to do with this; third that the teacher has everything to do with it; and fourth I am making a plea for the increased recognition of teachers who inspire in their pupils an attitude of warmth and good will.

Social Utility vs. Traditionalism

The choice of educational subjects has evoked much controversy. A mid-western professor of education has in a recent article flayed what he calls the Traditionalist School of education. By this he means "those who believe that the way to strengthen a pupil's memory, judgment or reasoning is to give him stiff doses of the traditional subjects, Classics, Mathematics, Science." Opposed to this is what he calls the "Social-Utility School," the members of which emphasize the teaching of such knowledge as is likely to function directly in the life of the individual. The professor is not mealy-mouthed about the defects of the traditionalist school, which, he admits "includes the great majority of university professors, a very large proportion of professional men, doctors, lawyers, etc., etc." and he adds, "a goodly number of top business executives!" This is how he disposes of the claims of the traditionalists. "They think," he says, "that judgment is a unity and that people have good, medium, or poor judgments. The exercise of judgment in one area like mathematics will, therefore, automatically improve one's judgment in purchasing a car, choosing a wife or voting in an election!" Then he goes on to expound the credo of his Social-Utility School. "They," he explains "believe that training in memorizing poetry may be of little or no help, or even a downright hindrance, in remembering the stock quotations, or in recalling the names of acquaintances!" How true but perhaps how unimportant! Education has, of course, to do with mental discipline and also with vocational instruction, but who will not agree with Livingstone when he says "our fundamental and chief task of education today is to form the right attitude to life"? There are others who approach the problem more plausibly.

The Humanities

When receiving a degree in Toronto, Mr. Anthony Eden recently expressed the hope that there might, in education, be a greater emphasis upon the humanities. We observe the trend towards prolonged college lecture courses on the history of Western Culture and the like. I am not convinced that we shall so simply purge the rising generation of the humors which have bedeviled us. Here is what A. E. Housman, a great scholar, poet and humanist, has to say, "I do not much believe in these supposed effects of classical studies. I do not believe that the proportion of the human race whose inner nature the study of the classics will transform and beautify is large," and again, "I never yet heard it maintained by the wildest enthusiast for Classics that the standard of morality or even of amiability is higher among classical scholars than among men of Science!" His final remark on the subject is refreshing. "The special effect," he says, "of a classical education on the majority of those who receive it is not to transform and beautify their inner nature, but rather to confer a certain amount of polish on their surface!!!"

There are teachers of language, literature, and history as insignificant as an iota, so dry they rattle. The human soul can congeal in etymology as readily as in our test tubes. Science holds no monopoly of heartless intellectualism. There are teachers who know their subjects cold. I was first taught Geology by a world-famous professor who could not conceal his scorn for freshmen. That finished the subject for me. My first introduction to Shakespeare was a minute hypercritical analysis of "Julius Caesar." I cannot, even now, manage to read this play without wincing. I know a professor of romance languages who had so spent himself on his books that he had nothing left over for his students. It was not until his own son had entered the class and then reported how the students disliked it that the realization came to him. It would seem evident that a curriculum based on literature, languages and history cannot, of itself, "transform and beautify our inner nature."

Then there are those who pin their hopes for better attitudes upon a more up-to-date religion.

Neo-Psycho-Analytical Religion?

Conspicuous among these is Liebman whose persistent best seller "Peace of Mind" aims to co-polymerize psychiatry and religion. There were things in this book which I found obscure. I have time for only a few excerpts. On page 38 I read, "Thou shalt love thyself properly and then thou wilt love thy neighbor." This seemed pleasant enough advice, but on reaching page 72 I read, "Experiments now indicate that the love of neighbor is a *pre-requisite* for love of self!" Can you blame me for deciding to love nobody until Research Director Liebman had made up his mind?

But to me the most astounding proposal in this book was a suggestion that what this age requires is not so much a transformation of man as a revised edition of the Deity. Here are his words "A religion that will emphasize man's nothingness and God's omnipotence may have fitted the needs of many Europeans but it will not satisfy the growing self-confident character of America. There is a chance for a new idea of God—a religion based not upon surrender or submission." Liebman may be a teacher with a large following in a neurotic world but surely what is needed is not so much a new religion embellished with phychiatric trappings as an inspired re-statement of the truths expounded by the Founder of Christianity. And now what about Science, our own subject?

Science and Miracles

The Founder of Christendom worked miracles which brought many people to see and hear Him. But when they were assembled He spoke not about miracles but about the meaning and the ends of life. Upon the "miracles" of Science is now focussed the attention of the world. What have we got to say? What is *our* message? Must it be that we are scientists, not priests, so that our sole duty is to keep building ever higher the huge pyramid of scientific knowledge?

Rather, has the time not come when everyone who practices our profession should remind those around him that while insisting on the green light to the truth in intellectual matters we are also beings who in our personal philosophy agree with Plato when he says, "It is not the life of knowledge, not even if it included all the sciences, that creates happiness and well-being, but a single branch of knowledge—the science of good and evil"?

Surely, then, our message to all, including Jacques Barzun the distinguished educator who has called upon Science to humanize itself, may well be that science, as such, needs no more, or less, humanizing than does archaeology or etymology, but that first and foremost must come a right attitude to life, for this is an end, whereas science like all other aspects of knowledge is, in itself, but a means. But how can such attitudes be fostered in a day when the simple faith of our forefathers has largely vanished, when the fission of the nucleus overshadows the Sermon on the Mount? My answer is, "Mainly through our teachers."

Teachers

Right attitudes are not fostered by this or that subject of study. They *are* fostered by the inspiration and the example of great teachers. Here is how Richard Livingstone expresses it, "The moving force of life is a vision. Men devise means when they are mastered by the passion for an end. Education is impossible without the habitual vision of greatness. A teacher cannot give an adequate training in anything unless he knows, and can make pupils see, what is great in it." May I give an example or two?

A Vedic Hymn

At high school our classics teacher had decided to cajole me into Classics at the University. At his home in the evenings, he would grill me in Latin and then try to interest me in Greek. This he would interlard with references to older Sanskrit roots. One evening my attention must have wandered for he suddenly stopped and finished out something. It was a poem from the Rig-Veda. He began by drawing me a picture of a Hindu shepherd high up in the Himalayas watching the sunrise, four or five thousand years ago, his soul bursting with the beauty of it. Then he read to me his own translation. As he read, his voice thickened and his eyes filled. He handed me the sheet of paper. It is entitled "Hymn to Dawn—Rig Veda X." I will read only the first line: "Go Forth, go forth, upon the ancient pathway . . . ."

I have kept it through the intervening forty years. At the time it was water off a duck's back. At the University I studied, not classics, but chemistry and physics. But now, after all these years, that water has returned to refresh a sometimes disgruntled soul! By an impulse not to be denied I began a year ago the study of Greek, and now in Homer I have at last found the hobby which will sustain me for the rest of my lifetime. Like chickens, early influences come home to roost. And this priceless boon, I owe to my old teacher who lived humbly but *whose memory is beyond price in the hearts of his pupils. He did more than impart knowledge—he inspired an attitude.*

Algebra

Our freshman class in Algebra at the University was huge and raucous. Like everyone else I had always loathed Algebra. We groaned as we sat awaiting the first lecture. To our surprise, it was the head of the department who entered. Beaming upon us he said he was going to devote his first lecture to one of the most fascinating parlour tricks he knew. Would we please pay close attention and see how bright we were. Then he began expanding on the blackboard an infinite geometric series — something simple like $1+1/3+1/9+1/27$, etc. On and on he went across the huge blackboard, chatting pleasantly and getting us to help him with the mental arithmetic. After quite a number of terms had been unhurriedly expanded, he turned to us: "Gentlemen, do you understand that I could go on like this for all Eternity? That this series never ends? Think of it and never again look upon mathematics as a dry subject. The terms I have just set down can be expanded till they stretch from this room to the outermost reaches of interstellar space — and yet even there they will not even terminate." "Now, gentlemen," he went on, "what would you do if I asked you to add together all of these terms? Impossible? Not at all. Be here promptly at 9 on Thursday and I'll tell you the secret."

Our cynicism had vanished. Next Thursday we turned up alive with curiosity — and to many of us, from that moment, *Algebra had lost its terrors. The reason was that our professor had infused Algebra with warmth. Our attitude had changed. To him, and therefore to us, Algebra was no longer an affair of the head. It had become an affair of the heart!*

Obstetrics

The next incident occurred in my Junior year. My roommate, a medical student, burst in one day, replete with wrath. "The queerest lecture I've *ever* had." He explained. The lecture was the opening one on childbirth. It was the senior professor, an eminent authority. He had bowed formally to the huge class, as used to be the custom in those days, then without a word turned to the blackboard with his crayon and began to draw a straight line. His hand moved with agonizing slowness. After ten minutes the stupefied students could see naught but a huge letter, four feet high. The letter was "W". Another ten minutes passed and by now an "A" had appeared. The students were getting noisy and shuffling their feet. All they saw was the silent professor's back and that crayon creeping along at a snail's pace. By and by a huge "I" had taken its place next to the "A". Another ten minutes and the gong had rung. The lecture was over. But at that moment the professor had finished his fourth and last letter. It was a "T". "W-A-I-T" stared out at the throng of medical students—a monumental lesson (meaning "never be in a hurry to use instruments") which would stick in their minds throughout their lives. The professor bowed, still without uttering a word, and left the room. . . . My friend is now a distinguished obstetrician —*But he has never ceased extolling the wisdom of this great teacher who knew when to make details subservient to principle and who had contrived to invest his students with an attitude of humility and awe towards their profession.*

Art

Last autumn I attended a course of lectures on the history of Greek art. The rather austere professor had led us through the Minoan and Mycenaean periods. Now he projected on the screen that exquisite vase by Exekias showing Dionysus in a Boat. He looked at it silently for a minute. Then he turned to us and said, "Ladies and gentlemen, we now approach an era in describing which I may depart from my customary attitude. I may occasionally break down into superlatives. Can you forgive me? *Of course we forgave him! We sat forward in our seats. The glow of warmth was there and had enveloped us.*

Entropy

I am now going to say a word about Entropy. Do I hear someone ask, "Is he going to romanticize on That?" Why not? Who can brood over this magnificent concept with other than a feeling of humility, awe, even of reverence? A century ago, Carnot, Clausius, and Kelvin fought their way through to its announcement and not without opposition. I have never met Karl K. Darrow but his recent paper on the Concept of Entropy in the *Journal of Physics* (1944) treats the subject with so much elegance and warmth as to make one feel that entropy ought to be included as one of the Humanities. What matter whether we look upon entropy as a quantity which can flow, or as Darrow prefers, an attribute which never flows but rises or falls in situ, or whether we understand it best in terms of disorder or randomness? *What does matter, for the purpose of this discussion, is that entropy can be presented in a manner which promotes an attitude, and a student who can be led to feel in this way about entropy, as well as think about it, is on the road towards being a humanitarian: he is the more likely to use entropy for good, rather than for evil ends. He is developing an attitude of warmth rather than one of heat—and if there is anything needed in this day, it would seem to be less heat and more warmth!*

Music

There are many ways to a healthy attitude. Take music. There is a member of this institute whom I frankly envy: After a gruelling day in town he will arrive at his country house late in the evening, sit down at his Hammond organ and play great music for hours on end. What a royal road to inner peace. His attitude towards music had been fixed in early childhood. This friend is present this evening but I must not mention him by name. He might never forgive me.

I talked to a brilliant young mathematician, head of his department in a large Eastern college, about scholarship versus inspirational teaching. His explanation was stark. "When promotions come up, the college authorities," he explained, "feel that they must rely upon some concrete evidence of merit. If a man does not publish, how can his abilities be evaluated?

Here I reach the core of my thought this evening. *We are as never before in history surrounded by concrete progress, by the things which are seen. It is in the realm of things not seen that our failures occur. So my plea is for the greater recognition of teachers whose output is measured not alone in papers but in pupils—not alone in books but in boys. When we find such let us honor them, reward them and promote them. Let us make clear the high regard in which we hold them.*

For they will be teachers whose attitudes towards their subject—be it literature, art or science—will be one of warmth as well as of light. They not only will think but feel, and impart these attitudes to others. And upon such may depend our survival in this atomic age.

Tragedy in the North

Years ago I went hunting for moose, to a club in Quebec. It was November and cold. The members were talking of a tragedy that had just occurred. A New Yorker had come up on his first hunt. He had gone to Abercrombie & Fitch and bought everything in sight; compasses, flashlights, pocket-axe, a huge hunting knife and 100 rounds of heavy ammunition. At night when it came time to return, he suddenly realized that he had lost his bearings. Then he began tearing about in endless circles. The tracks next morning told the tale of his night of desperate struggle. Exhausted, he had finally collapsed. Next morning the search party discovered his body, still laden with gadgets and 100 rounds of ammunition. All he needed to do the moment he was lost, was to stop, light a fire and warm himself through the night. By morning help would have come to him.

I wonder if we today are not in a similar case. The pace of our life may mean that *we* have lost our bearings, and are trying to make up in activity what we lack in direction. Perhaps *we* are weighed down by too many gadgets and too many rounds of ammunition, so that through concentration upon the means, we have lost sight of the ends. Perhaps we, too, need to pause and light a fire, the fire of human understanding, and having warmed ourselves and our attitudes by its side throughout the night, it may be that by morning help will come to *us*. . . .

MANAGEMENT—
TODAY AND TOMORROW

by

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PART THREE

Management Tools and People

The third in a series of three papers on Management prepared for The Engineering Journal

In Part II of this series we discussed the policies and tangible methods and tools which could be used to aid good management of a company. We have assumed the proper people to use the tools, so there would be sufficient interest in the work that the tools would be used to best advantage. This, unfortunately, is not always the case. It has been demonstrated time and again that tools can work to the personal satisfaction of the workers, for the good of the company, for the improvement of product and for the improvement of production. They may be a source of inspiration to the workers. On the other hand, by using unsound tools or by using unsound methods their use has sometimes been distorted, bringing dissatisfaction, deterioration of relations between the workers and management and, finally, to an impasse between the two.

In the early days, when management tools were used with less care and less fairness than today, these conditions of distortion and dissatisfaction often resulted. We have had many strikes and bitter recriminations against the so-called stretch-out, which is the misuse of a tool which, in its proper form and application, has been a source of real satisfaction to both management and labour. Recollections of these misuses of the past are still reflected in some of the policies of unions and, in fact, of management as well, which are only slowly being broken down as barriers to a more perfect understanding between management and labour.

Although much may still be done in advancing industry by the improving of methods and techniques, the new gains are now relatively small and may grow less, save for the possible introduction of some major revolution, such as occurred when steam power was discovered. Yet there are obviously great gains still possible from better utilization of human resources. This is best illustrated in the negative aspects, a strike or merely a lack of harmony among the working force. This can modify the technological gains, can even bring about the failure of an industrial organization or, in the long run, even of an industrial society.

This task of proper use of tools by their acceptance on the part of their users is not a simple one. The science of psychology is making inroads on the border of this field. Pending the time when it can produce accurate results on the basis of cause and effect in the mental processes of people, we must do the best we can to study the problem and come to conclusions by trial and error. The picture of the old watchmaker making a complete watch is a familiar one. He was skilled. He manufactured each part of the watch and put it together. He sold it as a complete product of his own effort. The art of making the watch was passed down from father to son. Thus in the old days, the craft idea of individual production and individual output, bearing a name to be proud of, was the chief motivation in the excellent products which came from such a system.

Obviously such a system was expensive, and today in mass production it is not possible to put the worker's name individually on a piece of merchandise. It bears instead the name of the organization to which the worker gives his time. In this process, the worker has changed from doing the whole job to doing a very small part. Perhaps now he just screws up one nut on one piece of the assembly. More and more complicated machines are being developed, there is a growing need of highly skilled workers who will understand the construction, operation and maintenance of these machines. This group, however, is a small one compared with the large number of workers who merely feed or tend machines. The workers are mass performers, doing repetitive operations.

During the war there was another development which hastened this trend, namely the necessity to de-skill operations because of the great demand and the intense shortage of skilled labour. During this process of change in manufacturing methods, which is still not complete, all workers have become more and more educated; more able to tackle complex jobs; more able to think through operations which have become less and less frequent in need.

There will always be a group of workers who are satisfied with today's machine feeding. On the other hand, there still remains a large body of workers which is dissatisfied with routine and restless under its demands. What can be done to bring back to these workers some substitute for the old craftsman's sense of a job well done because it bore his name? The complete answer has not been found. So today, we have to apply what remedies we can see are needed, to take care of the more obvious disadvantages of the present system. Regardless of what is done, there must be in these matters a genuinely honest approach by management to their solution.

Suitable Jobs and Working Conditions

Some jobs must be tedious and repetitive, and there are people who fit naturally into jobs of that type. The selection of someone who finds the work gets on his nerves is immediately laying the foundations for the eventual failure of that employee on that particular job. In this field, the methods used by the psychologist have gone a long way in making it possible to select the right people for the right job. A full job description can be interpreted by the psychologist in terms of aptitudes and personal characteristics which will lead to contentment with the work presented.

This ability, however, must be applied in a general way. There is no such thing as distinctive division of all jobs into those which are repetitive and those which require a considerable amount of intelligence, training or personal ability. Where jobs have some repetitive features in them and occasionally require distinct individual ability, then we must select for that ability and we may still have dissatisfaction over the repetitive portion of the job. We find today that more and more attention is being paid to having pleasant surroundings for the worker, such as colour schemes, light supply, and in acceptance and recognition of certain personal habits of relaxations that will lead on the whole to more contented workers.

Motion study, if properly applied, is one of the essential things to bring about acceptable and interesting conditions of work by the employee. He should be seated correctly; he should have the proper light; he should be taught to eliminate all useless and tiring motions; mechanical helps should be available wherever possible.

Proper Rewards for Best Effort

In spite of the official frowning upon incentive payments on the part of the international unions, basically the individual worker likes to be paid for any extra effort that he puts into his job. He is afraid of it only when he fears that the administration of an incentive plan will be unfair. This fear, of course, he inherits from the former use of the stretch-out and the unfair application of piece work without sound time study work. The rewards must, of course, be paid promptly. They must be adequate, and easily understood so that they can be computed by the employee so he can make a check of his own pay.

In some plants, profit sharing for all has been most effective — at least over short periods of time. Generally, it has not yet stood the test of time through periods of contraction in business activities, so that it can be put down conclusively as an effective method of rewarding employees and assuring their co-operative interest. As the complexity of the employee's job increases, so does the difficulty of establishing a correct incentive to the employee. To sum up the whole matter of financial rewards, the employee, whether he be worker or foreman, or even farther up the ladder, must have a conviction within himself that his extra effort will be rewarded, and that he will be paid according to the work he does. He may then be fully contented with the plan of award.

Opportunity for Advancement

When surveys of workers have been made to indicate what they consider most desirable in a job, it is seldom that "opportunity for advancement" appears high on the list. It seems obvious, then, that the opportunity for advancement is not so important as is generally supposed. With some, however, who have within them the aptitude and the desire to manage, the opportunity for advancement is an important requirement for contentment. To management, therefore, falls the obligation to find out which employees are not only qualified to advance but also have the desire and, when opportunity for advancement comes, to see that the proper qualified men are given the advanced positions. This can be accomplished through the industrial psychologist, through the testing of employees and through the study of their aptitude for management, their general intelligence and their ability to control and manage others.

Training and Education

This refers to the training in skill and method on a particular job to which an employee has been assigned.

Adequate training in the proper methods of doing jobs, and practice of the method, are essential to making interested new workers. No newcomer likes to find out for himself how the job should be done, or through begrudging instructions given by fellow workers, who perhaps dislike to take the time to do that sort of thing.

One of the best means of education are the conferences held with the higher supervisory group, often called training conferences. In these meetings men are taught to think, they are given prescribed studies to pursue and, through discussion, they are educated in the business problems, in management techniques, in the proper way to handle workers and many other phases of management.

The foreman certainly cannot be neglected. He determines, or helps to determine, whether the employees are going to be happy in their work. The foreman must apply these mechanical helps in such a way that they will be converted to interest on the part of the worker. For that reason, it is impossible to place too much emphasis upon the proper education of the foreman in performing his duties as management's representative, in these days when those duties are so much more complicated.

Giving Employees Facts

Another form of education needed by all employees is education respecting the company's activities and problems and profits. In more and more factories, there are times when all the employees and their families are guests of the company so that they can see what the complete process in the factory is. All this contributes to the interest of the employee in the product in the making of which he may perform only a very small part. Some facts and figures must also be given to the employees.

Again the honesty of the management and the sincerity of management's purpose must be clearly evident, because any employee receiving figures from the company is apt to look at them with a sceptic's eye, unless he has full confidence in the management.

The ideas of the workers today on the profits which industry is making are sometimes fantastic. Surveys have shown that the average worker believes that the company is earning from four to ten times what it actually is in profit, on the investments of the stock holders, or on sales, or on whatever basis they may be measured. In this connection, it is worth while quoting from an address before the Society for Advancement of Management by Mr. Walter Cenerazzo, president of the Watchmakers' Union.

> "I want to see Harvard, Yale, the University of Chicago, and every other institution in America, develop economists and send them into the plants and, on company time if you please, if necessary, bring in the foreman and the stewards, bring in the group leaders, the committee representatives of the Union, and teach them what their corporation is, what the industrial and sales problems are, how the company arrives at the price for which they sell the product —teach them everything there is to know about the company, and make those courses six weeks, two or three days a week, a couple of hours a day. Then, at the end of that period, you can rest assured that when Mr. Nathan, the economist, and such people, start to preach about those great big profits that industry is going to make, some little guy is going to get up and say: 'Look Joe, here is the rate, here are the profits, here are the unit costs. Now, go sell that class struggle stuff elsewhere.'"

The information given out in these classes could be printed in a simplified form and mailed to the employee at his home. The employee could then discuss in his leisure time the aims and problems of his company with his wife and family. In this way a family interest in the job and in the employer is built up. It is necessary that working men and women realize that the policy of producing less and getting more jeopardizes the security of their company, and thus their jobs.

Security and Participation in Management

High on the list of desirable qualities in a job the employee will write "security". This is being supplied in many benefits to employees, most of which increase in value with length of service. Planned production to minimize seasonal peaks and valleys, an annual guaranteed wage, service pensions and various forms of life, health and accident insurance are examples of plans adopted to increase job and social security. Whereas these material benefits do not in themselves satisfy the craft urge, they do contribute materially to the toleration of modern conditions without active complaint.

We have left to the last the most interesting of all modern movements to re-create interest in the part of the worker, that is, his participation in management. Here is the field where the educated worker, of whom there are many, will find his place; where the ambitious man can direct his ambition towards a profitable and constructive end. Here is the field from which management itself may select skilled future supervisors, foremen, superintendents and officers. Highly educated employees are going to participate in the management of the company whether the managers like it or not. It is being done in certain cases now. How could we look otherwise upon union activities in plants where they have a great deal to say about working conditions, the amount of output and matters of that kind, except as the participation of employees in the management of the company?

However, such participation has been used by labour itself as an "opposition party" to management, because management itself has not recognized these workers with exceptional abilities and made them a part of the management group. How then can that be done? The union, as an organization — an enterprise — with its own management group (setting their own salaries as in a company) makes an appeal to those workers in a company who find no outlet for their restless desire for advancement. Here they have a chance to advance, and they will grasp it unless the company searches them out and offers them equal or better opportunities as a part of the management group. If the employee accepts, he then changes his "political party".

Obviously management hasn't always tried very hard to find these skilled men, else we would not find so many times that union representatives show up better than management representatives in joint enterprises. These opportunities will provide outlets for some members of the restless group of to-day's routine workers.

Indirect Participation

There are other projects in which the workers can participate even as members of the union and operate through it. Two such projects are job evaluation and time study. Job evaluation involves a description of his job, giving in detail what he should do and to whom he should report, what his duties and responsibilities are and relating his job to others in the plant on some kind of an orderly system. Certainly, the employee has a right to give approval to his job description and to participate, at least, to the point of discussion of the evaluation of his job compared with others in the plant.

Similarly, time study is a matter with which the employee is directly concerned personally. It is used to determine what should be the fair output in a given standard time for the work on which the employee is engaged. Improper and unskilled time study has been the basis of great union complaint against the stretch-out and against the misuse of this tool in earlier times. Today employees elect their own stewards or representatives to go along with representatives of management, and to become capable themselves of making proper and skilled time studies. Then between the employee and the company there can be agreement as to what constitutes a standard amount of work which the employee should be expected to produce for a standard hour's pay. When the project is worked on and approved jointly, then there can be no question of complaint on account of stretch-out, and negotiations between employees and company become much simpler.

There are other methods of formal participation in management. One of these is the suggestion system, in which the employees have a chance of expressing their ideas through the suggestion box, receiving suitable reward for accepted suggestions. Properly administered, this creates a great deal of interest and takes advantage of many sound ideas from the employees, often leading to the discovery of employees with ideas who can be considered for subsequent promotion. A fair and conscientious administrative system obviously goes along as one of its essentials. Then there is participation of employees in various committees. There is the grievance committee, there is the safety committee and there may be other committees relative to different phases of the work on which the employees have a representative.

These are new interests, they are interests of a high type which can well occupy the minds and challenge the abilities of those employees who have not found enough to occupy their minds in the ordinary work which they do. All these are expressions of the trend towards the participation of employees in management. It seems certain that this trend will continue to accelerate both in number of companies adopting plans of this sort and, perhaps, in the extent of participation of employees in management.

Need for Measurement

When we were considering management tools and practices which were installed to make better production and to help ensure profits, one of the chief considerations given was to an adequate system of measuring the results. That same thing is needed in these relations between management and workers. Perhaps the degree of success of the effort can generally be seen in the general satisfaction of workers, in the lack of complaints, in the cutting down of grievances and in the ease with which management and workers can discuss company affairs. In the long run, that is probably the best way. There are, however, other ways of taking measurement occasionally, usually called attitude studies. In them, some neutral party circulates carefully worded questionnaires among all the employees asking very pertinent questions about the company, their position in the company, their griefs, their likes and dislikes — even getting down to persons. Questionnaires are unsigned and from them an analysis is made of the actual situation within the company. These produce surprisingly interesting results, and are most useful.

We have discussed above some of the things that are being done today towards substituting a new interest with the employees who, in the old days, would have had the craft interest and the personal interest in the work which was done. They are inadequate, they have not yet met the problem, which is extremely complex. Yet these measures are undoubtedly steps in the right direction, and will lead to other — and even better — understanding of the solution of the problem in days to come than is possible today with our present knowledge.

PHOTO-INTERPRETATION OF TRANSPORTED SOIL MATERIALS

(*Continued from page 340*)

using aerial photos since 1935. Practically all preliminary planning for new highway locations is now done from airphotos to a scale of approximately 1,000 feet to one inch. In conjunction with an accurate ground control survey, maps or study plans to a scale of 400 feet to one inch are prepared by the method referred to. All physical features are shown. The multiplex projector is used for drawing contours. With the stereocomparagraph form lines may be plotted, from which a general conception of the topography of the area may be secured. The chosen line is drawn on the prints and from these the location field party stakes the route without any reconnaissance.

The Soils Branch of the same department has found airphotos valuable for indicating sources of granular materials. These may be located on the photos in the form of eskers, kames, abandoned beaches, glacial spillway terraces or as outwash deposits. The photos may also be used in a detailed pedological survey of a highway location. The time required for the field work may thus be reduced to less than half that otherwise required, and in addition airphotos will indicate the areas where intensive field study is required.

Conclusion

These applications of airphoto interpretation are only a few of the many uses to which this technique may be adapted, whether it be in the field of geology, pedology, or any branch of civil engineering. The extent of the information contained in the modern airphoto is almost unbelievable to the layman. At present there are too few skilled in interpreting this information and in adapting it to various purposes. Much work is still required, with repeated checking between photos and ground, before a rapid translation may be made. This is necessarily limited to areas with which the interpreter is familiar or about which he has reliable knowledge. Airphotos give the interpreter a perspective which is not obtainable by any other method. Those familiar with their use would be reluctant to relinquish this modern aid.

Canada in the Berlin Airlift

Although the R.C.A.F. did not operate any aircraft in the Berlin airlift, Canadian-built aircraft were represented in the corridors leading to Berlin's Gatow airport.

The photograph shows an AVRO Lancastrian, the civil conversion of the famous Lancaster bomber, discharging fuel oil into ground tanks at Gatow. This aircraft was built by Canadians at Victory Aircraft Ltd., Malton, Ont., and was used on T.C.A.'s trans-Atlantic services before she joined the fleet of one of the civil air carriers who operated in the airlift under charter to the occupation authorities.

Sixty-Third Annual General Meeting

Convened at Headquarters, Montreal, on January 27th, 1949, and adjourned to the Chateau Frontenac, Quebec City, May 11th, 1949

THE BUSINESS MEETING

The Sixty-Third Annual General Meeting of The Engineering Institute of Canada was convened at Headquarters on Thursday, January 27th, 1949, at eight fifteen p.m., with Vice-President R. S. Eadie in the chair.

The general secretary having read the notice convening the meeting, the minutes of the Sixty-Second Annual General Meeting were submitted, and on the motion of Louis Trudel, seconded by Leon A. Duchastel, were taken as read and confirmed.

Appointment of Scrutineers

On the motion of F. L. Lawton, seconded by H. F. Finnemore, Messrs. C. E. Gelinas, Leo Scharry and J. D. Sylvester, were appointed scrutineers to canvass the officers' ballot and report the results.

There being no other formal business, on the motion of J. B. Stirling, seconded by J. A. Lalonde, it was resolved that the meeting do adjourn to reconvene at the Chateau Frontenac, Quebec City, at eight fifteen p.m. on the eleventh day of May, nineteen hundred and forty-nine.

The adjourned meeting convened at nine o'clock p.m. on Wednesday, May 11th, 1949, with President J. N. Finlayson in the chair.

Nominating Committee—1949

The general secretary announced the membership of the Nominating Committee of the Institute for the year 1949 as follows:

Chairman: John R. Kaye, Halifax, N.S

Branch	*Representative*
Border Cities	C. G. R. Armstrong
Calgary	H. B. LeBourveau
Cape Breton	W. S. Wilson
Central B.C.	H. L. Cairns
Cornwall	C. I. Bacon
Edmonton	F. R. Burfield
Halifax	G. J. Currie
Hamilton	I. M. Macdonald
Kingston	M. N. Hay
Kootenay	A. C. Ridgers
Lakehead	J. M. Fleming
Lethbridge	A. J. Branch
London	E. R. Jarmain
Moncton	R. L. Parsons
Montreal	W. Sharples
Niagara Peninsula	C. G. Cline
Ottawa	Norman Marr
Peterborough	A. L. Killaly
Quebec	C. H. Boisvert
Saguenay	B. E. Bauman
Sarnia	G. R. Henderson
Saskatchewan	E. K. Phillips
Sault Ste. Marie	R. A. Campbell
Saint John	F. P. Vaughan
St. Maurice Valley	J. H. Douglas
Toronto	A. E. Berry
Vancouver	P. B. Stroyan
Victoria	A. L. Carruthers
Winnipeg	T. E. Storey

Award of Medals and Prizes

The general secretary announced the various awards of the Institute for the year as follows, stating that the formal presentation of these distinctions would be made at the annual dinner of the Institute on the evening of May 11th.

Honorary Membership—to Dr. Malcolm Pirnie, consulting engineer, New York, N.Y.

Sir John Kennedy Medal — "A recognition of outstanding merit in the profession or of noteworthy contribution to the science of engineering or to the benefit of the Institute" — to Thomas H. Hogg, M.E.I.C., York Mills, Ontario.

Julian C. Smith Medal — "For achievement in the development of Canada" — to R. W. Diamond, M.E.I.C., Trail, B.C.

Gzowski Medal — to A. H. Wilson Busby, M.E.I.C., Trail, B.C., for his paper "Localized Overheating in the Wall of a High Pressure Vessel and its Effect on Rupture Strength".

Leonard Medal — to P. T. Bloomer, M.C.I.M., Kimberley, B.C., for his paper "Pillar Extraction at the Sullivan Mine."

Plummer Medal — to C. O. P. Klotz, M.E.I.C., Montreal, for his paper "Laurentien Aluminum".

Keefer Medal — to J. D. Mollard, M.E.I.C., Regina, Sask., for his paper "Engineering Significance and Photo-Interpretation of Some Transported Soil-Materials."

Ross Medal — to B. G. Ballard, M.E.I.C., Ottawa, Ont., for his paper "Recent Canadian Radar".

Students and Juniors Prizes

H. N. Ruttan Prize — (Western Provinces) — to A. G. Fletcher, S.E.I.C., Vancouver, B.C., for his paper "Draughting a Logging Topographic Map".

John Galbraith Prize — (Province of Ontario) — to K. R. Stehling, S.E.I.C., Buffalo, N.Y., for his paper "Rocket Propulsion".

Phelps Johnson Prize — (Province of Quebec, English) — to M. B. T. George, S.E.I.C., Regina, Sask., for his paper "Preliminary Design of a Light Racing Airplane."

Ernest Marceau Prize — (Province of Quebec, French) — to Gerard Gascon, S.E.I.C., Ishpeming, Michigan, for his paper "Exploitation des Gisements d'Ilmenite du Lac Tio."

Report of Council, Report of Finance Committee, Financial Statement and Treasurer's Report

On the motion of C. E. Gelinas, seconded by R. C. Flitton, it was resolved that the report of Council, the report of the Finance Committee, the financial statement and the Treasurer's report be accepted and approved.

Reports of Committees

On the motion of G. J. Currie, seconded by R. N. Coke, it was resolved that the reports of the following committees be taken as read and accepted: Legislation, Engineer in the Civil Service, Publication, Membership, Papers, Library and House, Admissions, Professional Interests, Employment Conditions, Board of Examiners, The Young Engineer, Prairie Water Problems, Employment Department, Canadian Standards Association, National Construction Council, Canadian Chamber of Commerce, Canadian Radio Technical Planning Board, Applied Mechanics Reviews.

Branch Reports and Ontario Division Report

On the motion of I. S. Patterson, seconded by J. J. Green, it was resolved that the reports of the various branches and of the Ontario Division be taken as read and approved.

Amendments to the By-Laws

Two proposals were presented for the amendment of the by-laws. One of these proposed that the limit of twenty placed on the number of honorary members be removed. The other proposed that under certain circumstances an alternate be authorized for a councillor who is unable to attend any specific meeting of Council. The first was approved unanimously without any discussion and the second was approved unanimously, as submitted, although there was some discussion as to the possibility of rewording one phrase.

The proposed amendments are as follows and will be submitted to letter ballot of the corporate membership in accordance with Section 80 of the by-laws:

SECTION 12

Fifth line — Eliminate the words: "The number of Honorary Members shall not exceed twenty."

PROPOSED NEW SECTION 30A

Alternates

In the event of a councillor being unable to attend a specific meeting of Council the executive of the branch may appoint an alternate (other than a councillor) for that meeting only who shall be a member of the branch, such alternate to have all the rights and privileges of the councillor whom he is replacing.

Canons of Ethics

The general secretary presented a report of a special committee of the Institute on the Canons of Ethics as proposed by the Engineers' Council for Professional Development (ECPD) which had been accepted at the annual meeting of Council held in Banff, in June, 1948. Among other things the report recommended that the Canons be submitted for approval to a general business meeting of the Institute, to be considered as complementary to and in amplification of the present Code of Ethics as adopted on January 27, 1925.

Past-President Challies pointed out that the Canons have been approved by the Founder Societies of the United States and several other organizations as well. Therefore he moved their approval and adoption by The Engineering Institute of Canada.

Colonel Grant, as the Institute's representative on the executive of ECPD spoke in favour of the proposal and expressed his pleasure in seconding the motion. On being put to the meeting, the motion was carried unanimously.

Election of Officers

The general secretary read the report of the scrutineers appointed to canvass the officers' ballot for the year 1949 as follows:

President:
J. E. Armstrong, Montreal, Que.

Vice-Presidents:
Western Provinces—H. N. Macpherson, Vancouver, B.C.
Province of Ontario—W. J. W. Reid, Hamilton, Ont.
Province of Quebec—R. E. Heartz, Montreal, Que.

Councillors:
Vancouver Branch—W. N. Kelly.
Kootenay Branch—J. V. Rogers
Edmonton Branch—J. E Cranswick
Saskatchewan Branch—F. E. Estlin
Lakehead Branch—W. H. Small
Border Cities Branch—F. J. Ryder
London Branch—V. A. McKillop
Toronto Branch—D. G. Geiger
Ottawa Branch—J. L. Shearer
Kingston Branch—R. D. Bennett
Montreal Branch—R. N. Coke, E. B. Jubien
St. Maurice Valley Branch—F. W. Bradshaw
Saguenay Branch—G. T. Malby
Saint John Branch—L. O. Cass
Halifax Branch—E. C. O'Leary

On the motion of M. Eaton, seconded by Viggo Jepsen, it was resolved that the report of the scrutineers be adopted, that the scrutineers be thanked for their services in preparing the report, and that the ballot papers be destroyed.

Retiring President's Address

The text of the retiring president's address appears on page 358 of this number of the *Journal.*

Vote of Thanks to Quebec Branch

On the motion of E. B. Jubien, seconded by F. W. Bradshaw, it was unanimously resolved that a hearty vote of thanks be extended to the Quebec Branch in recognition of their hospitality and activity in connection with the holding of the Sixty-Third Annual General Meeting.

Vote of Thanks to Retiring Officers

In presenting a motion of thanks to the retiring president, vice-presidents, and councillors, Past-President Cleveland stated that with the growth of the Institute these positions have become more and more important, requiring a considerable amount of work and thought. It was with this in mind that he was so pleased to present a motion of thanks and appreciation to this year's retiring officers. The motion was seconded by Mr. Buss and carried unanimously.

The meeting adjourned at nine forty-five p.m.

The Professional Meeting

There are some who have said that this year's annual meeting was the best ever attempted. That may be an overstatement, springing from some personal experience, nevertheless it is generally admitted that it was a good meeting. Quite readily it could have been the best but there are no absolute standards by which comparisons can be made.

The registered attendance was

992 which was close to the best that has been recorded for any Institute meeting. When the Quebec City branch is compared in numbers with Toronto and Montreal branches this showing will be appreciated as a remarkable achievement. The Quebec committee may well feel satisfied with the results of their efforts.

Both the technical and the social programmes were ambitious beyond previous endeavour. The former comprised twenty sessions, with six additional sessions on the management programme. The social programme included sightseeing tours of great variety, boat trips, plant trips, shiplaunching, golf tournament, with Muriel's Room turning up at the most unexpected places. The attendance at the technical sessions was most gratifying. In most cases the capacity of the room was tested to the full, and in some instances people had to be turned away for lack of space. Larger rooms could have been used to advantage, if they had been available. Testimony to the excellence of these sessions was abundant — the management papers being especially well received. It is planned that all papers and addresses will appear in the *Journal* with a full issue devoted to the management material.

Tuesday's Council meeting saw 17 of the 29 branches represented, with councillors in attendance from as far away as Halifax and Vancouver. At the meeting of the 1949-50 Council on Thursday, May 12th, there were representatives from 19 branches. Further details of these meetings will be covered in subsequent issues of the *Journal*.

The historic Garrison Club provided a delightful setting for the annual president's dinner which followed the Council meeting on Tuesday, the day preceding the official commencement of the meeting. Seven of the seventeen living past presidents were in attendance, including Dr. A. R. Decary of Quebec (1927) and A. J. Grant of Ottawa (1930) and, in accordance with custom, each of these seven elder statesmen of the Institute addressed a few remarks to the guests. A magnificent engraved silver tray was presented by the Quebec branch to Dr. Decary to commemorate his 50th year of Institute membership.

It was a wise course which resulted in the address at Wednesdays' opening luncheon on the History of Quebec by Abbé Arthur Maheux, archivist of the Seminary of Quebec. The Abbé's delightful discourse about the various "tourists", from Jacques Cartier to those of the present day, helped delegates and their ladies to gain a better appreciation of the old city and the points of interest which were visited on the sightseeing tours.

It is difficult and of course unnecessary to pick out any one event as the most outstanding. The packed ball room, gallery and foyer for the television talk and demonstration would indicate that it ranked high, but the 572 persons who heard Dr. Lillian Gilbreth at luncheon on Friday would find it difficult to place anything ahead of that thrilling experience augmented as it was by the brilliant introduction of Dr. Gilbreth made by Elizabeth (Elsie) MacGill, M.E.I.C. These two women, each an outstanding engineer in her own country, gave a performance as a team, which is not likely to be surpassed or even equalled in future Institute meetings.

An unusual international flavour was achieved by the management sessions, which enjoyed the support and participation of a number of eminent American delegates. In addition, the Brazilian Management Council (IDORT) was represented by Dr. M. E. Alvaro accompanied by Senora Alvaro, and Dr. Hugo deHaan of Switzerland, secretary-general of the International Management Committee (CIOS), attended at the request of the president of that body, Assar Gabrielson of Stockholm. Dr. de Haan was accompanied by his daughter and her husband, Mr. N. B. Carey of New York.

Jacques Greber, M.E.I.C., consultant to the Federal District Commission, delivered a paper on the plan for the national capital at Ottawa. A model and a number of maps and photographs were set up in the library of the Chateau in connection with this paper.

For complete adequacy to the occasion, the banquet speaker on Friday evening was pre-eminent. On limited notice Mr. S. John Wright of London, England, flew from Regina and his duties with the U.K. Agricultural Engineering Mission to address the banquet in place of the Premier of Quebec who was prevented by illness from attending. Mr. Wright measured accurately his audience, the occasion, and the demands of the extensive annual banquet programme, and his address was a real contribution to better understanding between Canada and the United Kingdom. In a rare combination of wit and dignity he told of Britain's efforts toward economic recovery and pleaded with Canadians not for pity, but for understanding and the maximum of co-operation. Truly the cause of the old country was well served at this meeting.

The story of this outstanding meeting would not be complete without a tribute to the Radio Corporation of America and the Canadian Broadcasting Corporation, which two organizations combined to sponsor the television technical paper and popular demonstration. Dr. R. D. Kell, director of television research at R.C.A.'s laboratories in Princeton, New Jersey arranged for the supply of several television cameras with at least twelve receivers and all the necessary auxiliary equipment and he delivered the technical paper and participated in the popular demonstration. Alphonse Ouimet, M.E.I.C., assistant chief engineer of the C.B.C., with K. R. Patrick of R.C.A.'s Montreal office, supervised arrangements on the Canadian side and directed the audio operations of the programme.

The Students' Conference and Branch Officers' Conference were directed this year in a greater measure by the participants themselves. The students were especially keen and a great deal of credit is due to Dr. G. R. Langley for the time he has devoted, in Quebec and for several years previously, to the work of the Institute's student guidance committee in whose province the conference lies. The Branch Officers' Conference suffered somewhat because the most satisfactory times at which it might be held conflicted with council or general meetings and these meetings command the attendance of most of the branch officers. On this occasion, however, the officers appointed their own chairman and secretary and met at times agreeable to most of the delegates. The minutes when transcribed should yield much of value to council and to the branches. Representatives from 14 branches were in attendance.

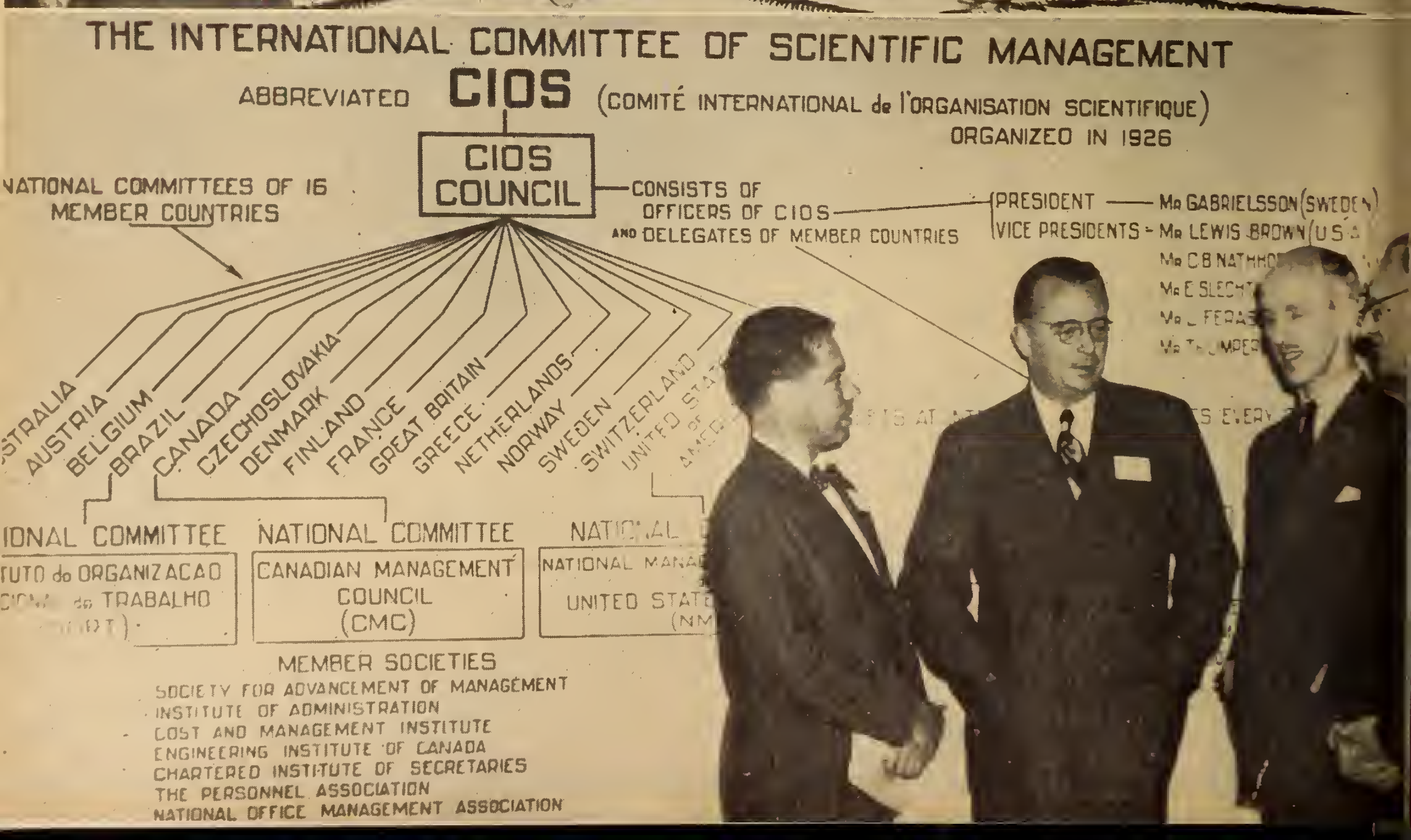
This 1949 annual meeting emphasized, more than has any previous Institute meeting, the value of publicity to the profession and the paramount position of the In-

Nineteen of the 29 branches were represented at the Annual Meeting of Council on Tuesday preceding the Annual Professional Meeting.

SIXTY-THIRD ANNUAL MEETING PHOTOGRAPHS

All photos courtesy C.P.R.

The student delegates deliberated for a full day on Tuesday, May 10, and reconvened their meeting for several additional sessions during the four days of the Annual Meeting. They are shown here with Past-President L. F. Grant and Dr. G. R. Langley (3rd and 4th from left).


THE INTERNATIONAL COMMITTEE OF SCIENTIFIC MANAGEMENT
ABBREVIATED CIOS (COMITÉ INTERNATIONAL de l'ORGANISATION SCIENTIFIQUE)
ORGANIZED IN 1926
CIOS COUNCIL
MEMBER COUNTRIES
CONSISTS OF OFFICERS OF CIOS AND DELEGATES OF MEMBER COUNTRIES
PRESIDENT — Mr GABRIELSSON
VICE PRESIDENTS - Mr LEWIS BROWN
AUSTRIA
BELGIUM
BRAZIL
CANADA
CZECHOSLOVAKIA
DENMARK
FINLAND
FRANCE
GREAT BRITAIN
GREECE
NETHERLANDS
NORWAY
SWEDEN
SWITZERLAND
NATIONAL COMMITTEE
CANADIAN MANAGEMENT COUNCIL (CMC)
MEMBER SOCIETIES
SOCIETY FOR ADVANCEMENT OF MANAGEMENT
INSTITUTE OF ADMINISTRATION
COST AND MANAGEMENT INSTITUTE
ENGINEERING INSTITUTE OF CANADA
CHARTERED INSTITUTE OF SECRETARIES
THE PERSONNEL ASSOCIATION
NATIONAL OFFICE MANAGEMENT ASSOCIATION

ON THE FACING PAGE:

Some of the Institute's senior officers (l. to r., back row): R. S. Eadie, Quebec vice-president; W. J. W. Reid, vice-president-elect for Ontario; L. Austin Wright, general secretary; R. E. Heartz, vice-president-elect for Quebec; J. A. Vance and W. L. Saunders, Ontario vice-presidents; (front row) I. P. Macnab, Maritime vice-president; J. E. Armstrong, president-elect; J. N. Finlayson, president; Alex Lariviere, Quebec vice-president.

At the head table for Wednesday's dinner, student delegates shared honours with past-presidents and other officers of the Institute. In the centre photo are shown (l. to r.) A. G. Norem, student delegate from the University of Alberta; President Finlayson; Vice-President Eadie, who presided; John Fisher, "The C.B.C.'s wandering reporter and observer of the Canadian Scene"; Dr. A. R. Decary, the senior past-president in attendance at the meeting.

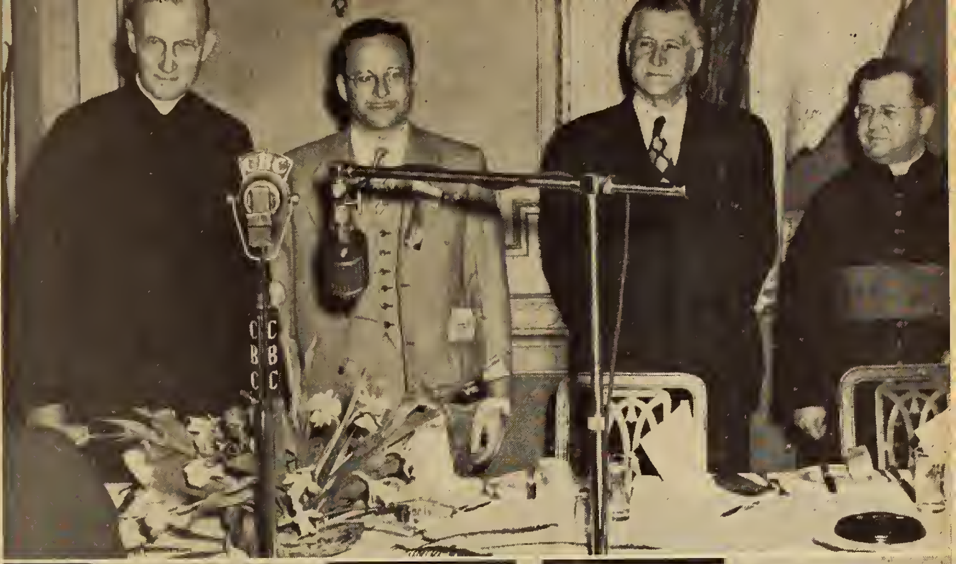
Executives of CIOS with the organizational chart of the Committee: (l. to r.) Dr. M. E. Alvaro, president of IDORT; H. B. Maynard, president of the National Management Council; C. A. Peachey, chairman of the Canadian Management Council; and Dr. Hugo de Haan, secretary-general of CIOS.

ON THIS PAGE:

At Wednesday's opening luncheon the principals were (l. to r.): Abbé Arthur Maheux, of the Seminary of Quebec, who spoke on "The History of Quebec City"; Paul Vincent, chairman of the Quebec Branch and official host to the meeting; His Honour Lucien Bourne, mayor of Quebec, who extended his City's welcome; and Mgr Alphonse Marie Parent, secretary general of Laval University.

The two centre photographs include the past-presidents who were guests of President Finlayson at the Garrison Club on Tuesday evening. They are (above l. to r.): DeGaspé Beaubien, L. F. Grant, Thomas Hogg, F. P. Shearwood, A. R. Decary, President Finlayson; (Below l. to r.): A. J. Grant, E. A. Cleveland, K. M. Cameron, and the president-elect, J. E. Armstrong. On the extreme right is K. R. Mitchell, councillor for the Halifax Branch, whose opposite number (not shown at the left of the upper photo) was councillor W. N. Kelly from Vancouver Branch.

Among those at the head table at the Annual Banquet were (l. to r.) Mrs. Malcolm Pirnie; the speaker, S. John Wright; President Finlayson; and Dr. Lillian Gilbreth.



PRESENTATIONS

The Institute's medals and prizes for 1948-49 were presented at the Annual Banquet on Friday, May 13. At top (l. to r.) President Finlayson congratulates Dr. Thomas Hogg, R. W. Diamond and A. H. W. Busby who were awarded, respectively, the Sir John Kennedy Medal, the Julian C. Smith Medal and the Gzowski Medal. These are the three highest awards of the Institute, the Sir John Kennedy Medal being awarded only once every two years. Below (l. to r.) C. O. P. Klotz, B. G. Ballard, and M. B. T. George receive from the president the Plummer Medal, the Ross Medal, and the Phelps Johnson Prize.

Other prize winners who were unable to be present were J. D. A. Mollard (Keefer Medal); A. G. Fletcher (Ruttan Prize); K. R. Stehling (John Galbraith Prize); and Gerard Gascon (Ernest Marceau Prize). The Leonard Medal had been awarded on a prior occasion to P. T. Bloomer. Details of these awards were published in the May issue of the *Journal*.

Left:—The President confers honorary membership in the Institute on Dr. Malcolm Pirnie, distinguished consulting civil engineer, and past-president of the American Society of Civil Engineers. (Citation appears on page 366).

elegates, their ladies and guests were received at the Annual Ball on Friday night by, (l. to r.), ast-President J. N. Finlayson, Mrs. Pirnie, Dr. Malcolm Pirnie, Mrs. Armstrong, President E. Armstrong, Mrs. Vincent and the chairman of the Quebec Branch, Paul Vincent.

he speaker at Friday's Luncheon was Dr. Lillian Gilbreth the distinguished American manage-ent engineer, shown here with Vice-President I. P. Macnab of Halifax, who presided at this nction.

t the President's Dinner, Dr. A. R. Decary of Quebec received from the Quebec branch the graved silver tray shown in the picture below. In the group with Dr. Decary and President inlayson are A. B. Normandin, E. D. Gray-Donald, President-elect J. E. Armstrong, Roger esjardins, Alex Lariviere, Paul Vincent and Hector Cimon, who made the presentation.

The Boat Trips

The Boat Trips

On Thursday afternoon many of the delegates enjoyed boat trips on the St. Lawrence and visited the Quebec Bridge and other points of interest. The Vessels were the government ice-breakers, Ernest Lapointe and N. B. McLean.

Left, top:—This group includes J. A. Beauchemin, Montreal, (at the wheel), and C. E. Gelinas, Montreal, at his right.

Centre:—Mr. Walter Manning, Quebec (Superintendent, Department of Transport, who arranged the boat trips); Mr. and Mrs. E. R. Brannen, Fitzroy Harbour; Mr. and Mrs. L. C. Sentence, Hamilton.

Bottom:—Mr. and Mrs. J. T. Lang, Montreal; and Mrs. J. R. Mills, Montreal; Max L. Baker, Halifax.

Right, top:—Mrs. Roger Desjardins, Mrs. Maurice Ostiguy, Mrs. L. J. Barron, Mr. Phil French, Mrs. L. Trudel, Mrs. A. P. Benoit, Messrs. Jacques and A. P. Benoit.

Right Bottom:—Mr. E. E. Orlando, Montreal; Miss Dorothy White, Quebec; Mrs. I. S. Patterson, St. Catharines; Mrs. Orlando; Mr. and Mrs. H. W. Lea, Montreal.

The photo at right centre shows the three youngest delegates studying the television camera. Tony (age 3), Alec (4), and Steve (5) are sons of Dean R. M. Hardy of the faculty of engineering, University of Alberta. Mrs. Hardy is shown at the left of the photograph.

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stitute as the central publicity agency for the profession. John Fisher "the C.B.C.'s wandering reporter and observer of the Canadian scene" based his broadcast on Sunday, May 15th on his attendance and observations of the meeting. Citing, as an example, the distinguished career of Miss Elsie MacGill and her comparative anonymity in Canada, Mr. Fisher chastized the engineers for their excessive modesty and failure to acquaint other Canadians with their achievements. Mr. Fisher told the delegates in a short address at dinner on Wednesday evening, May 11th, that Canada's future depends on the development of her vast natural resources and, because such development is the responsibility of engineers, they are the most important group in Canada today. The press services and the C.B.C. in cooperation with the C.P.R. Public Relations Officer at the Chateau Frontenac covered the meeting very thoroughly with resulting widespread publicity throughout the country.

A special feature arranged by John Fisher and the Canadian Broadcasting Corporation was a fifteen minute discussion on Wednesday afternoon by President J. N. Finlayson, President Elect J. E. Armstrong, Past President, L. F. Grant and the Maritime vice-president, Ira P. Macnab, which was recorded for broadcast over the national network and was also played for the delegates at Wednesday's night dinner after Mr. Fisher's brief introductory remarks.

The meeting was also given further radio coverage in a third fifteen minute broadcast on the French network on Sunday May 15th, and two announcements broadcast with the C.B.C.'s regular news service.

There can be no doubt that the Institute's friends in industry contributed much to the success of the meeting by their generous contribution to "Muriel's Room" (perhaps the quotation marks are superfluous in view of the firm place this institution has achieved at annual meetings). It is in this delightful rendezvous that old friendships are renewed and new friendships made. The custom does much to weld the parts of an annual meeting into a solid entity productive of maximum values in business and pleasure.

The 1949 annual meeting has established a standard which will not be easily equalled or surpassed. However, with each passing year the Institute grows in stature and influence and the sights are imperceptibly raised for the programme and attendance at the Annual Meeting. Already the formation of committees is under consideration and it will not be long before the assembly will begin of all the thoughts and suggestions out of which will emerge in Toronto in July next year the combined annual summer meeting of the American Society of Civil Engineers and the annual meeting of The Engineering Institute of Canada. If the comments heard in Quebec can be believed most of this year's delegates will be in attendance and the Toronto committees will be striving mightily to meet their great expectations.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

Please Print

Surname

....

Given Names

....

Home Address ☐

....

....

Employer

....

Employer's Address ☐

....

....

(Check address to be used for Institute mail.)

Product or Service

....

Position or Title

....

Degree, Year & College

....

Advise changes promptly

Address of the Retiring President

J. N. Finlayson, D.Sc., M.E.I.C.

Delivered before the Sixty-third Annual General and Professional Meeting of The Engineering Institute of Canada, Quebec, Que., May 11, 1949

During my term of office it was my privilege to visit twenty-eight of the twenty-nine branches from Sydney to Victoria and observe at close range the contributions that engineers are making to the peacetime economy of the Commonwealth. The time was auspicious for such a series of visitations. In every locality and in every centre there were marked manifestations of progress, installations of new plants, expansion of industry and abundant prosperity. On this occasion I feel that I cannot do better than attempt to present in outline some of the outstanding developments under way which will help to raise still higher our standard of living and contribute to the improved welfare of our citizens.

The annual meeting of the Institute at Banff in June, 1948, coincided with the occurrence of most disastrous floods in the Fraser River and Columbia River valleys. Approximately 51,000 acres of land were covered with water for one whole month, May 26 to June 26. I am glad to report that due mainly to the splendid efforts of our engineers — many, members of the Institute — the work of restoration and rehabilitation is progressing favourably. The estimated cost is more than ten million dollars. Improved types of dykes and improved methods of construction have been developed.

On the Campus of the University of British Columbia, under grants from the National Research Council, a scale model of the Fraser River delta is being built, where hydraulic problems pertaining to floods and irregularities of flow can be investigated. In the new Applied Science building a hydraulic laboratory complete with flumes and measuring tanks for experimental purposes has been installed, together with a modern materials testing laboratory and a well-equipped soils testing laboratory. Substantial additional units of hydro-electric power were installed in British Columbia during the year under review; new pulp and paper and celanese mills are in the course of construction; proposals have been announced for the establishment of aluminum and steel refineries.

In the Province of Alberta there is renewed activity in oil production. The announcement that Alberta has proven to the world that it is one of the best hopes for new major oil reserves is endorsed by leading oil authorities. The United States is no longer able to meet even its own peacetime needs; it has become a net importer of oil. This is of major importance to Canada, long an importer. It is stated to be within the bounds of possibility that Canada's annual total consumption of oil (approximately 100 million barrels) may eventually be forthcoming from this rich prairie province. Leduc, Woodbend, Redwater, Lloydminister, have become almost household names. 355 wells were drilled in Alberta and Saskatchewan in 1948. The major oil companies in the U.S.A., together with many independents, are associated with our own Canadian companies in the annual outlay of 50 million dollars on oil exploration and development. There is a report that the Government of Alberta will probably pass legislation to permit the export of natural gas to other parts of Canada. This would add many millions of dollars of revenue to the Province, the oil companies, and their shareholders.

The proposed Spray River hydro-electric development and the construction of the St. Mary dam and irrigation system in Southern Alberta are examples of a steadily expanding industrial and agricultural life. Travelling across the prairies, one is impressed with the work done and projected by the P.F.R.A. The proposed dam across the South Saskatchewan at Elbow is most interesting. Recent discoveries of uranium metals in the Lake La Ronge area give promise that Saskatchewan may become one of the main sources of atomic energy in North America.

In Manitoba additional units have been added to hydro-electric plants on the Winnipeg River and definite plans have been made for a large new development at Pine Falls. Mineral production is steadily increasing and present indications are that expansion will be still greater in the near future. The Sherritt-Gordon Mines Limited has continued an aggressive programme of exploration and development of the copper-nickel occurrences in the Lynn Lake area; the Nor-Acme gold property of the Howe Sound Exploration Company Limited is about ready for full-scale operation. Also noteworthy is the production in increasing quantities of activated non-swelling bentonite in the Thornhill area.

Passing along to Ontario, it is announced that completion of the mill construction by Kerr-Addison Gold Mines (4,000 tons daily) places that mine in the enviable position of being Canada's largest gold producer and the second largest in the western hemisphere, exceeded only by Homestake. Discovery of pitchblende at Theano Point on the north shore of Lake Superior gives promise of important mining developments in that area. Plans are proceeding for the commencement of the rapid transit project in Toronto and the city planning scheme in Ottawa.

Perhaps the outstanding engineering event that occurred in the Province of Quebec during the past year is the commencement of the development of the iron and titanium deposits in the northeastern areas of the province. New hydro-electric units on the St. Maurice, the new highway to the Saguenay district, the aluminum arch bridge at Arvida and the proposed titanium refineries at Sorel are items of major interest and importance.

It was a very great pleasure for me to find thriving business and manufacturing conditions in the Maritime Provinces. The marketing of fruit, coal, etc., met with many problems apparently incapable of immediate solution, but the hope is expressed that improved conditions will prevail before the close of the calendar year. It is exhilarating for a native of the Maritimes to note the progress made in the construction of hard-surfaced highways. Intense interest is exhibited in the prospect for improved transportation facilities at the Strait of Canso, and the recent announcement that a bridge is to be built is enthusiastically applauded in all the provinces.

I had hoped to be able to visit Newfoundland but, after due consideration, it was decided expedient to postpone the inauguration ceremonies of Branch No. 30 until the late summer or early autumn.

Although I saw only a relatively small part of the three billion dollar construction programme authorized in Canada for the current fiscal year, I do appreciate the privilege accorded me, as president of the Institute, of conveying to you information on some of the activities in which many of our members are engaged. I may mention parenthetically that three-quarters of the volume of investment mentioned above is due to expenditures of private business and individuals and less than one-quarter to government expenditures on construction machinery and equipment. It is interesting to hear from reliable sources that in the last four years more than 8 billion dollars have been spent on construction machinery and equipment — more than half as much as the government spent directly on Canada's war effort. More than 275,000 housing units have been built, at about twice the rate of the thirties or fifty percent better than in the prosperous twenties.

It is predicted that in the years beyond 1949, private investment activity will begin to slide to a lower level than that which prevailed in the immediate post-war period. If so, public investment may have to provide a larger proportion of our expansion budget.

It is reassuring to be told that to this end, preparatory plans are being made.

While, as indicated in these remarks, there is evidence of an abundant prosperity in every part of Canada; while we are expanding our capital structure at unprecedentedly rapid rates, with the consequent increase in production of goods and services; while we are dazzled by government and corporation surpluses, there is grave concern expressed concerning the shrinkage of our old overseas markets and the collapse of the North Atlantic trade triangle which solved many of our marketing problems in the pre-war years. More than half of our overseas exports on which our prosperity depends are paid for through the Marshall Plan. That Plan may possibly be abandoned in about three years. Today even the Marshall Plan is proving insufficient to buy all our surpluses as the apple growers, fishermen, and lumbermen well know. Avoidance of a depression within the next decade will require a measure of good luck and good management. I trust that it may not be considered irrelevant to suggest that the engineer, by virtue of his training in the fields of production, transportation, and distribution may be able to make a contribution towards the solution of economic and political problems. Perhaps it is not mere coincidence that an engineer, a member of this Institute, has been appointed Minister of Trade in the Federal Cabinet or that his former portfolio, that of Reconstruction and Supply, has been filled by the appointment of another engineer. Our guests from sister societies in the United States will be pleased to recall that both these gentlemen studied the science of engineering at the Massachusetts Institute of Technology.

One of the most interesting of the visits was that to the youngest member of the Institute family at Kamloops when I had the honour and pleasure of presenting the Charter to an enthusiastic group of members.

The Maritime Professional Meeting held at The Algonquin, St. Andrews-by-the-Sea, New Brunswick, September 8-10, was an unqualified success. The committees are to be congratulated for the excellent programme of papers and entertainment that they provided. It was interesting and instructive to observe the degree of harmony and co-operation that exists between Institute Branches and Professional Associations in the Maritimes.

The realization of a need for co-operation among the various institutes, associations, and societies in dealing with national problems led to an interesting round table discussion at Vancouver last month, concurrent with the annual meeting of the Dominion Council of Professional Engineers. Representatives of the Engineering Institute of Canada, the Canadian Institute of Mining and Metallurgy, the Chemical Institute of Canada and the Canadian Society of Forest Engineers met with the officers and members of the Dominion Council on Tuesday, April 5, 1949. Although no agreement was reached, there was an almost unanimous expression of opinion as to the necessity for the formation of a body that will be empowered to speak for all Canadian engineers in matters of general interest and national import. It is to be hoped that subsequent meetings of a similar nature will be able to find a common satisfactory answer to this all important question.

Much concern is expressed in every branch about the employment outlook for graduate engineers in view of the large classes attending the universities. The Bureau of Technical Personnel has compiled some very useful information which it issues periodically in bulletins and reports. In a recent publication it is stated that there are in Canada about 25,000 engineers who are either graduates of recognized universities or technically qualified members of appropriate professional organizations or both. The new supply in prospect includes 3300 graduates in 1949, 3500 in 1950, and 2300 in 1951, about 9000 in all for the three years mentioned. Some of the prospective graduates may be lost to Canada through emigration, some lost to engineering by diversion to other fields. On the other hand, there will be some additions to the ranks by the entry into Canada of a number of engineers from other countries.

The Bureau conducted a survey in an attempt to arrive at an estimate of future demand for trained engineers. Information was sought from about 1500 employers including practically all of the largest users of engineering skills. As a result there was an indicated demand for about 2000 new graduates each year during the five-year period 1947-1952. It was revealed that approximately three-quarters of all the engineering personnel in the country were on the payrolls of less than 200 employers. More than one-third of the country's engineers find their livelihood in the various phases of manufacturing operations. Dean Young reports that less than one-half of the engineering graduates of the University of Toronto devote their lives to purely technical pursuits. Graduates in great numbers are to be found in responsible administrative positions, in industry, in the public service, in finance, insurance, law, the diplomatic service, and on the bench. I might add graduates from my classes are occupying pastorates in important metropolitan churches.

At this point the question naturally arises: what kind of education must we provide if our young engineers are to succeed in meeting the requirements of the broader field that is opening for them? This question has been studied seriously by the Institute, especially by its Committee on the Young Engineer. The late Lord Tweedsmuir who spoke on several occasions to engineers had something to say about education. Put broadly he said the question is how to combine humanism with technique. By humanism in education we mean the study of man in all his relations as thinker, as artist, as a social and moral being; by technique, the acquisition of that special knowledge which directly concerns the making of a livelihood. We must face this question with common sense and a proper perception of realities. It is no good giving a boy a smattering of culture if he is going to starve, and, in this day and generation, it is not much more good to provide him with some equipment for earning his daily bread and to leave his mind narrow and inelastic. One side of a solution is that there should be an honest endeavour to introduce into our engineering curricula some elements of what we call the humanities. The other may be found in the way in which technical training itself is conducted. If it is regarded not merely as the acquisition of a certain number of rules of thumb, but as a piece of serious mental training, then we are introducing the spirit of the humanities into the vocational side. We are producing not only technicians, but men and women with minds. We are producing potential citizens.

There remains the pleasant duty of returning thanks for the great honour done me. I have enjoyed every one of the presidential duties very much indeed. Some of you know that when this office was first proposed to me I was not very eager to accept it. I was aware that there were certain important duties which I would be expected to perform and I was conscious of limitations, geographical and otherwise, that would prevent complete fulfilment. I could only promise that when any such duty did present itself, I would do my best to meet it in a right and proper manner according to the best of my judgment. I retire from office now more appreciative than ever of the high place that the Institute has in the community. I regret that it was impossible for me to attend more than two or three meetings of Council during the year, and my warmest thanks are now tendered to the vice-presidents, councillors, chairmen, and members of committees who carried the ball so effectively. I am especially grateful to all kind friends who provided transportation and good company throughout their respective districts and to the General Secretary and his efficient staff for making plans for all my journeys with such diligence and dispatch. I convey to my successor in office my best wishes for a very happy and fruitful year.

Special Convocation at Laval University

On Wednesday, May 11, during the Annual Meeting, a special convocation was held by Laval University to confer the honorary degree of doctor of science on President Finlayson; A. R. Decary, Quebec superintendent of public works; and A. B. Normandin, technical adviser to the Quebec department of hydraulic resources.

In the photograph taken after the ceremony at the University are (l. to r.) Hon. Senator Paul Henri Bouffard, K.C.; Dr. Decary; Dr. Finlayson; Canon Maurice Laliberté, vice-rector of Laval; Dr. Normandin; and Mgr. Alphonse Parent, secretary general of Laval.

From Month To Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

World Government

The undersigned were appointed by the council of the Institute as delegates to the 53rd Annual Meeting of the American Academy of Political and Social Science held in Philadelphia, Pa., on April 8 and 9, 1949, the general topic of discussion being World Government, Why? When? How?

Most of the speakers were, as with virtue, for World Government of some sort but differed about the degree of surrender of national sovereignty and the method of arriving at a World State. The World Federalist would make it in one jump, others through the processes of revision of the United Nations charter and others would have none of it. Nearly all agree that scientific advancements in mass slaughter make necessary some controlling body with power to settle international difficulties, some believing in immediate action, others thinking there was sufficient time for evolution instead of revolution.

The discussion of the International Trade Organization (I.T.O.) was productive of the most spirited knockdown and dragout fight Dr. Clair Wilcox was in favour of the I.T.O. pacts even although they have many complicated escape clauses which are so involved no one can understand them and they make escape difficult. He pointed out that twenty or more nations were already functioning under the pacts and that over double that number would adhere to them, and that Canada would have to make the least changes in its tariff policies. Dr. Elvin H. Killheffer opposed the pacts as not being sufficiently favourable to the United States. He maintained that tariffs were the least objectionable form of barriers in the way of world trade. He also took exception to many of the clauses of the I.T.O. pacts as being unrealistic.

Of the more than twelve speakers, about one-half had been connected, in one way or another, with the United Nations or its affiliated organizations. Others included the diplomatic representatives to the United States, economists and members of organizations such as the American Tariff League, the American Civil Liberties Union and others.

The aspects of Communism, Socialism, Fascism, and Capitalism were referred to many times and the general impression was that the majority of the speakers held views which were somewhat to the left of center, tending toward a socialistic attitude as distinguished from the Communist philosophy.

The problems faced by small nations under present day world conditions were discussed by some of the speakers. The complete text of all of the addresses made during the meeting will be published in the July issue of "The Annals" of the Academy and your delegates have arranged to have two copies of this publication presented to the library of the Institute for the use of the membership.

Your delegates were entertained by the Academy at luncheon on April 8 and had, at all times, a most pleasant and profitable two days. They thank the Institute for the opportunity to represent it and remain,

Yours truly,

S. Logan Kerr, M.E.I.C.,
Consulting Hydraulic Engineer,
Philadelphia, Pa.

W. S. Pardoe, M.E.I.C.,
Professor of Hydraulic Engineering, University of Pennsylvania,
Philadelphia, Pa.

The Presidential Visits

For many years it has been the custom for presidents of the Institute to visit the branches whenever possible during their terms of office. Since they are leaders in the profession and are invariably busy men, the sacrifices of personal and business affairs which they must make to devote three full months to the annual branch visits can be readily appreciated.

There is no doubt that the visits are valuable and are favoured by the branches. Attendance at the meetings at which the President speaks is often the record for the year and there is fruitful discussion of Institute affairs. It is customary for the president and general secretary to have less formal meetings with the executive of each branch, and these meetings have clearly contributed to the present robust condition of the Institute.

The itinerary for President Finlayson's trip from his home in Vancouver to the Annual Meeting in Quebec included all those branches which he had not visited previously: Victoria, Vancouver, Kootenay, Lethbridge, Calgary, Regina, Winnipeg, Lakehead and Sault Ste. Marie. The perversity of the weather marred a perfect score when fog prevented his plane from landing at Sault Ste. Marie and the meeting there had to be cancelled. It may be possible, however, for Dean Finlayson to complete his 29 visits by calling at Sault Ste. Marie on his way back to Vancouver during the summer.

The president was accompanied by the assistant general secretary. Mr. Laird had proceeded to Vancouver via Saskatoon and Edmonton where he had met with branch executives and visited the Universities of Saskatchewan and Alberta.

In Victoria the ladies were included at a dinner meeting in the Empress Hotel with Reg. Bowering, the branch chairman presiding.

An enthusiastic welcome was tendered by a large attendance of Vancouver Branch members in the York room of the Georgia Hotel. On the day following Mrs. George W. Allen, wife of the branch chairman received the visitors and branch executives at her attractive home which commands a superb view of the sea from the slopes of West Vancouver.

At the Kootenay Branch, membership is composed mainly of engineers and executives of the Consolidated Mining & Smelting Company of Canada Limited. The president and assistant general secretary were guests of the company at South Slocan and Trail and in the latter centre there were two luncheon meetings with branch members and the executive, and a large dinner meeting with the ladies present and with civic executives and members of other technical societies as guests.

The party were met at Lethbridge by Chairman W. L. Foss, Secretary-Treasurer Dave Cramer, R. D. Livingstone, J. M. Davidson, R. S. Lawrence, C. S. Clendening, and other members of the branch. They spent the afternoon inspecting the tremendous P.F.R.A. earth dam which is rising from the bed of the St. Mary River to augment the already extensive irrigated areas of Southern Alberta — and thereby add to the prosperity of this already well-endowed province. A large dinner meeting was held at the Marquis Hotel.

At Calgary, in addition to the general meeting, at the Renfrew Club, the visitors enjoyed an illuminating discussion of Institute matters at a luncheon with the executive. Officials of Calgary Power Limited, under the direction of Mr. G. A. Gaherty, M.E.I.C., president of the company, arranged for a visit to the company's new power development at Spray Lakes near Banff, where, with appropriate ceremony, Dean Finlayson closed the cofferdam to direct the water through the diversion tunnel and unwater the site of the new earth dam on which the project is based.

In Regina the president and assistant secretary were privileged to attend a joint meeting of the Saskatchewan Branch executive and the Council of the Association of Professional Engineers of Saskatchewan. Cooperation under the agreement in Saskatchewan is very close and the Institute and Association act largely as one body — an ideal arrangement.

The Winnipeg Branch executive set an outstanding example of interest in Institute affairs. They had prepared an agenda for the executive luncheon, and the discussion carried on through the whole afternoon with almost all members remaining to participate. It was obvious that those present carried the opinions of the branch members in all matters and the visitors were given the impression that Winnipeg Branch is in an extremely healthy condition.

The next and as it proved later, the last stop was at the Lakehead where the travellers were joined by Mr. J. A. Vance, one of the two vice-presidents in Ontario. The party lunched with the branch executive and a record attendance turned out to welcome the president and his party at dinner at the Country Club. After dinner, the group adjourned to a comfortable lounge where a most stimulating informal discussion continued until close to midnight.

After four attempts to land at the fog-shrouded airport which serves Sault Ste. Marie, T.C.A. was forced to carry the party on to Toronto and after a telephone conversation with branch officials the meeting was cancelled, to the president's extreme disappointment.

The general meetings which each branch held on the occasion of the president's visit are not treated in detail in the foregoing as they have been and will be treated fully by the branch news editors in the appropriate section in this and other issues of the *Journal.*

There is no doubt of the great value of the visits of the president to the branches. Their usefulness can be increased proportionately as the executive will endeavour to sample membership opinion on all issues and arrange informal meetings with the president with agenda of all controversial issues and full unrestricted discussion. The meeting with the executive at Winnipeg was particularly noteworthy in this respect and might well be regarded by other branches as a model of procedure by which the maximum benefit may be secured from the presidential visits.

News of Other Societies

The **Canadian Electrical Association's** 59th Annual Convention is being held at the Banff Springs Hotel, Alberta, on June 28, 29 and 30, 1949.

B. C. Fairchild, managing director of C.E.A., is in charge of arrangements. His office is at Room 704 Tramways Building, Montreal 1, Que.

The **Institute of Power Engineers,** 496 Church Street, Toronto. Ont., announce that Canada's Power Show will be staged at the Royal York Hotel, Toronto, on November 28, 29 and 30, and December 1.

The show will contain exhibits of the products of leading power equipment manufacturers. Designed primarily for the Canadian supplier, many other countries will also be represented. Attendance is estimated at double that of the last power show in 1947, which attracted 6,000 persons connected with power plant engineering.

The **Community Planning Association of Canada,** has announced that the National Citizens' Conference on Community Planning will take place at the Fort Garry Hotel, Winnipeg, Man., October 6-8, 1949.

The Conference will discuss "Building Lessons of the 1940's; Planning Opportunities for the 1950's".

Further information will be supplied by the Association, 56 Lyon Street, Ottawa, Ont.

The Montreal regional conference of the **American Institute of Chemical Engineers,** September 7, 8 and 9, 1949, will devote two days to technical papers. Plant visits to several industries at Shawinigan Falls, Que., have also been arranged.

Members of the Engineering Institute are invited to attend, and the local committee on arrangements includes several E.I.C. members. Its chairman is Dr. H. R. L. Streight, P.O. Box 10, Montreal.

The Annual meeting of A.I.Ch.E. for 1949 will be at Pittsburgh, Pa., at the William Penn Hotel, December 4-7.

The first Plant Maintenance Show, an exposition devoted exclusively to cost reduction through improved installation, operation and maintenance of equipment and services in factories, warehouses and other plants, will be held in the Auditorium, Cleveland, Ohio, January 16 to 19, 1950. Clapp & Poliak, Inc., of New York will manage the exposition.

Concurrently, a 4-day conference on plant maintenance methods will be held, with L. C. Morrow, editor, *Factory Management and Maintenance*, as general chairman.

The **American Institute of Mining and Metallurgical Engineers** includes in its calendar of 1949 meetings a regional meeting at Neil House, Columbus, Ohio, on September 25-28; and the fall meeting, under the auspices of the Institute of Metals Division of A.I.M.E., in Cleveland, October 17-19. The next annual meeting of A.I.M.E. will be in February, 1950, in New York, at the Statler (Pennsylvania) Hotel.

Headquarters of A.I.M.E., are at 29 West 39th St., New York.

The **Federation of Sewage Works Associations,** 325 Illinois Building, Champaign, Illinois, has chosen Hotel Statler, Boston, Mass., as headquarters of its 22nd annual meeting on October 17-20, 1949.

Host to the Federation will be the **New England Sewage Works Association,** which will combine its twenty-first annual meeting with the national convention.

The 1949 semi-annual meeting of the **American Society of Mechanical Engineers,** is being held June 27-30, at San Francisco, Cal.

The Society's fall meeting is scheduled for September 28-30 at Erie, Pa.; and the annual meeting will be in New York on November 27 to December 2, 1949.

Offices of the A.S.M.E. are at 29 West 39th St., New York 18, N.Y.

The 52nd annual meeting of the **American Society for Testing Materials** will be in session June 27 to July 1 at Atlantic City, N.J., at Hotel Chalfonte Haddon Hall.

The Society' first Pacific area national meeting will be at the Fairmount Hotel, San Francisco, Cal., October 10-14, where some 70 technical papers will be presented.

Information can be obtained from A.S.T.M., 1916 Race Street, Philadelphia 3, Pa.

The 1949 summer convention of the **American Society of Civil Engineers** will be in Mexico City, July 13-15. The fall meeting is scheduled for Washington, D.C., November 2-4; and the Society's next annual meeting will take place January 18-20, in New York City.

A.S.C.E. headquarters are at 33 West 39th St., New York 18, N.Y.

The schedule of 1949 meetings of the **American Institute of Electrical Engineers** includes: the summer general meeting at the New Ocean House, Swampscott, Mass., June 20-24; the Pacific general meeting at the Fairmount Hotel, San Francisco, Cal., August 23-26; the midwest general meeting, at Netherland Plaza Hotel, Cincinnati, Ohio, October 17-21.

A.I.E.E. headquarters are at 33 West Thirty-ninth St., New York, N.Y.

The west coast meeting of the **Society of Automotive Engineers** will be held August 15-17, at the Multnomah Hotel, Portland, Ore.

Inquiries should be addressed to S.A.E. at 29 West 39th St., New York 18, N.Y.

The programme of the 57th annual meeting of the **American Society for Engineering Education,** in session June 20-24 at Rensselaer Polytechnique Institute, Troy, New York, consists of four general sessions to hear and to discuss papers of general interest together with some sixty functional conferences to discuss a variety of educational problems.

Professor A. Allan K. Booth, Department of Mechanics, Rensselaer Polytechnique Institute, Troy, is in charge of registration.

At the 1949 Engineering and Marine Exhibition, at Olympia, London, England, August 25 to September 10, 1949, the seventeenth exhibition in the series instituted in 1906, over 600 exhibitors will be represented.

The honorary president of the Exhibition is Rt. Hon. Sir John Anderson, P.C., G.C.B., G.C.S.I., G.C.I.E., F.R.S., Chairman of the Port of London Authority. The organizers are F. W. Bridges & Sons, Ltd., Grand Buildings, Trafalgar Square, London WC2.

For the Second International Mechanical Engineering Congress, September 1949, Paris, France, has been chosen as the locale.

Theme of the Congress will be "Production Efficiency."

The Congress Secretariat is at 11, Avenue Hoche, Paris (VIIIe).

Second General Meeting of the Ontario Provincial Division

The second general meeting of the Institute's Ontario Provincial Division was called to order at 9 A.M. March 19th, 1949, with Mr. J. R. Dunbar in the chair.

The meeting considered the "Toronto Brief" which was submitted to Council by the Toronto branch in 1946 and decided that the reply to the Brief by the committee on professional interests constituted the full action necessary and that the question required no further consideration. The general feeling of the meeting was that many of the recommendations of the Brief have been implemented in whole or in part and that further benefits could result if the contents of the brief were kept before Institute bodies for future reference.

The subject of shore line erosion on the Great Lakes was considered. Mr. W. R. Rice stated that the Honourable George H. Doucett, Minister of Highways and Public Works, through the Deputy Minister of Public Works, Mr. George N. Williams, is anxious to give all assistance possible in the matter of shore line erosion within the scope of the various provincial Acts of Parliament and to cooperate with the Federal Government in schemes for relief within the provincial boundaries. Mr. Rice stated that he is already planning immediate meetings with some municipal bodies which have requested investigation by the provincial government and other governing bodies into shore line erosion and protection problems.

After some discussion the meeting moved that "a committee be formed to include one member from each branch whose geographical location be such that they would be interested, with the object of communicating with, and assisting other groups now specifically concerned with the problem of shore line erosion, and placing the whole problem before the community involved."

The subject of collective bargaining was raised and Mr. D. D. Whitson stated that the objective of the Toronto group in submitting a memorandum to Institute Headquarters was to explore ways and means of getting the Ontario Government to allow certification of units of the Association of Employee Professional Engineers & Assistants and to maintain the certification of those already certified at the time of the change in legislation which restricted engineers from legal provisions relating to collective bargaining. There was considerable discussion as to the effectiveness of the bargaining units without the legal backing which they had formerly enjoyed and the point was once again raised as to whether the various engineering bodies had been right in advocating the exclusion of engineers from the provisions of the collective bargaining legislation. The general feeling of the meeting was in favour of this action but there were opinions expressed that a minority group did exist which favoured collective bargaining and the engineering bodies had some responsibility toward this group.

It was moved that, in view of the fact that the problem is receiving adequate attention from both the Federation and the Ontario Association, the Institute would be wise to withhold further action until these other groups have completed their studies.

In the matter of new business it was suggested that the views of Mr. J. G. G. Kerry regarding a St. Lawrence Deep Waterway should be placed before the executive of the Ontario Division for discussion.

There was also a definite feeling that the Institute should be taking more positive steps to ensure that young engineers receive instruction, information and consideration with the object of inducing a real desire for Institute membership.

The meeting adjourned at 11 A.M.

Personals

Notes of the Personal Activities of Members of the Institute

Dr. J. J. O'Neill, M.E.I.C., vice-principal of McGill University, Montreal, and dean of the Faculty of Engineering of McGill, was elected in February last as chairman of the Arctic Institute of North America.

Dr. O'Neill is a charter member of the Arctic Institute, and is active in several geological and engineering societies. He is Dawson Professor of Geology at McGill.

V. R. Currie, M.E.I.C., has been appointed commissioner of works and city engineer of the City of Kingston, Ont.

Mr. Currie, a graduate of Queen's University, class of 1923, has been since 1928 with the Department of Transport of Canada, and was stationed most recently at the Welland Ship Canal at St. Catharines, Ont.

He is a veteran of both World Wars serving in the latter with the R.C.E. with the rank of captain.

E. G. Cullwick, M.E.I.C., left in June for Scotland, having been appointed the first Watson-Watt Professor of electrical engineering in the University of St. Andrew's, at University College, Dundee, Scotland.

Mr. Cullwick graduated from Cambridge University in 1925, and was for some time connected with Canadian General Electric Company, Limited, at Peterborough, Ont. He held University appointments subsequently; in 1928-1935 as assistant professor of electrical engineering at University of British Columbia; in 1935 as lecturer in engineering at the Military College of Science, Woolwich, England; in 1936, again at U.B.C., as associate professor electrical engineering; and from 1937 at the University of Alberta, as professor and head of the Department of electrical engineering.

During the recent war, on leave from the University of Alberta, he served in the R.C.N.(R), as director of electrical engineering at Naval Service Headquarters, Ottawa, receiving the rank of captain (E), and being awarded the O.B.E in 1946. He resigned from his university post in 1946, and was appointed director of the Electrical Research Division of the Defence Research Board, at Ottawa, which position he has relinquished, to take the appointment in Scotland.

Alphonse Ouimet, M.E.I.C.

Alphonse Ouimet, M.E.I.C., assistant chief engineer of the Canadian Broadcasting Corporation, has been appointed by the Corporation, as coordinator of television.

He has been engaged in television work and research since his graduation from McGill University in 1932 when he was employed as a research engineer with Canadian Television Ltd., Montreal. In 1935 he joined the Canadian Radio Broadcasting Commission and later became operations engineer for the C.B.C.

In 1939 he was made general supervising engineer and in 1941 received his appointment as assistant chief engineer Two years ago he made a study tour of television in Britain, France, Holland and the United States.

K. W. Fraser, M.E.I.C., has been appointed manager of sales by the Canadian Westinghouse Company Limited, Hamilton, Ontario.

Mr. Fraser was at Hamilton, as assistant to the vice-president in charge of sales, since 1948. He had previously been district manager of the Quebec District, with headquarters in Montreal. A graduate of the University of Toronto, in the 1927 class in electrical engineering he spent several years with the Westinghouse Electric and Manufacturing Company at Pittsburgh, Pa., and returned to Canada in 1930 when he entered the Montreal district office on sales work.

H. L. Cairns, M.E.I.C., has been transferred to headquarters of the Public Works Department of British Columbia at Victoria, with the position of office engineer. He has been at Kamloops, B.C., a locating engineer for the Department.

Mr. Cairns relinquishes with regret his connection with the new Central British Columbia branch of the Institute, which he has served as secretary-treasurer since its inauguration January last.

George Bromley, M.E.I.C., has advised of the opening of a new professional engineering office of Kearns & Bromley, associate consulting engineers, at Wolfville, N.S. The office will be under the supervision of Mr. Bromley, and will offer services in connection with power plants, heating systems, water supply, sewerage, ventilation, air conditioning, refrigeration and electric systems.

Mr. Bromley has been in the firm since 1946 working from the Montreal office. He had done other consulting work in Montreal in 1945, after his discharge from the R.C.N.V.R. in which he served with the rank of Lieutenant. He is a graduate of University of Manitoba class of 1936, with the degree of B.Sc. in electrical engineering.

J. G. MacGregor, M.E.I.C., has recently been named general manager of the Canadian Utilities Limited, Edmonton, Alta.

Mr. MacGregor, a past councillor of

J. G. MacGregor, M.E.I.C.

the Institute has been with Canadian Utilities since his graduation in 1929 from the University of Alberta. He worked at Calgary until 1931, when he was transferred to Vegreville in charge of the Company's diesel plants and transmission and distribution systems in that area. In 1939 he was transferred back to Calgary as assistant manager, but went to the Edmonton office in 1948.

H. A. Cooch, M.E.I.C.

Harold A. Cooch, M.E.I.C., formerly vice-president in charge of sales, has been elected president of the Canadian Westinghouse Co. Ltd. Mr. Cooch has been associated with the Company since 1910. Following graduation in electrical engineering, from the University of Toronto, Mr. Cooch entered the Company's apprentice engineering course at Pittsburgh. He has been in the Westinghouse sales force since 1912 and was transferred to the head office of the Company in 1923. The following year he was appointed assistant to the vice-president. In 1938 he was appointed vice-president, and was placed in charge of sales in 1944. He has been a director of the Company since 1946. Mr. Cooch saw service Overseas in World War I when he held the rank of Captain with the engineers of the 3rd Canadian Division. Mr. Cooch joined the Institute as a member in 1939 and has served the Hamilton branch in various executive positions.

Robert F. Shaw, M.E.I.C., was appointed in April last to the position of manager of engineering for The Foundation Company of Canada, Limited, and is located at the Company's head office in Montreal.

Mr. Shaw is a civil engineering graduate of McGill University, class of 1933. He joined Foundation Maritime Limited in 1937 as assistant to the vice president, building construction; was named assistant to the president in charge of shipbuilding; and later shipyard manager at Pictou, N.S. He returned to Montreal in 1945 to Foundation Company of Canada Limited. He was assistant to the president from 1946 until his recent appointment.

T. C. Main, M.E.I.C., and **E. M. Rensaa,** M.E.I.C., announce that their consulting firm, Main and Rensaa, will in future be known as Main, Rensaa & Minsos, as a result of the association with the firm of **A. O. Minsos,** M.R.A.I.C.

Mr. Minsos has been with the firm for some time as architectural consultant, and he now becomes a partner. He is a member of the Royal Architectural Institute of Canada and is a registered architect in Alberta. A Canadian by birth, Mr. Minsos received his architectural degrees in Switzerland and Germany, and after graduation did further study in town planning. He practiced architecture in Oslo, Norway, until his return to Canada in 1947.

In advising the *Journal* of this new association, Mr. Main said, "Mr. Rensaa and I feel that this country would benefit from a closer association between architects and engineers. The present arrangement in our firm, in our opinion gives us the opportunity of providing better service to the public."

Bernard Beaupre, M.E.I.C., was appointed early in 1949 as chief of the secretariat of the Engineering Division of the City of Montreal.

Mr. Beaupre graduated from Ecole Polytechnique, Montreal, in 1941, and after a year's service with Dominion Bridge Company in Montreal, he attended University of Toronto, doing postgraduate work in health engineering, and receiving an M.Sc. degree in 1943. He then joined the Division of Industrial Hygiene of the Ministry of Health of Quebec.

F. A. Hanington, M.E.I.C., is now an engineer with the Elgin Construction Company at St. Thomas, Ontario.

Mr. Hanington, an electrical engineering graduate of the University of New Brunswick, class of 1931, was previously supervisor of construction for the Veterans Land Act, at London, Ont.

K. R. Meyer, M.E.I.C., has joined the E. B. Eddy Company at Hull, Que., as development engineer, where he is to be responsible for work on coordinating and extending existing production and service facilities, and preparation of long range expansion programmes.

Mr. Meyer was previously with Stadler, Hurter & Co., Montreal, where for the last three years he was in charge of several design sections and of the requisitioning and estimating department.

Ralph C. A. Pittis, M.E.I.C., is with the Toronto Transportation Commission as assistant engineer, maintenance of way, at the Hillcrest Works, Toronto. Mr. Pittis, a 1937 graduate in civil engineering from the University of Toronto, was a maintenance engineer on the staff of that University prior to his recent appointment.

K. A. Lawrence, Jr.E.I.C., has been employed as an engineer with the City of Montreal. Mr. Lawrence is a 1946 graduate of McGill University, Montreal.

V. J. Pimenoff, Jr.E.I.C., has joined the staff of Canadian Broadcasting Corporation in Montreal. He is a 1949 graduate in electrical engineering from McGill University, Montreal.

Stuart Clark, Jr.E.I.C., who was formerly with the Thunderbay Paper Company, Port Arthur, Ont., is now a mechanical engineer in the Plant Engineering Department of Ford Motor Company of Canada, Windsor, Ont.

Arthur Martynse, S.E.I.C., has joined the staff of Canadian Industries Limited as a mechanical development engineer at Shawinigan Falls. He graduated in mechanical engineering this year from the University of Saskatchewan.

James Harris, S.E.I.C., has obtained a position with Canada Packers Limited in their Edmonton plant. Mr. Harris is a 1949 graduate in mechanical engineering from the University of Saskatchewan.

W. H. Kasperski, S.E.I.C., a 1949 graduate in mechanical engineering from the University of Saskatchewan, is with Hudson's Bay Mining and Smelting Co. Ltd., in Flin Flon, Man.

David Friesen, S.E.I.C., is employed by the Dominion Foundry & Steel Company in Hamilton. Mr. Friesen graduated in mechanical engineering this year from the University of Saskatchewan.

H. N. Young, S.E.I.C., has obtained a position with Canadian Pacific Railways. His duties commenced after graduating recently from McGill University.

G. L. MacLean, S.E.I.C., has been employed by Coca Cola Company Limited, Montreal, his duties commencing after graduating from McGill University in May.

J. F. Harris, S.E.I.C., has obtained a position with Stevenson & Kellogg Co. Ltd., Montreal, Que. He is a 1949 graduate from McGill University.

J. K. Picken, S.E.I.C., on graduating from University of Manitoba this year, joined the staff of the Hydro Electric Power Commission of Ontario.

Visitors to Headquarters

D. Roland Webb, M.E.I.C., Saint John, N.B., May 3.

S. John Wright, London, England, May 3.

A. H. Wilson Busby, M.E.I.C., Trail, B.C., May 7.

William N. Kelly, M.E.I.C., Vancouver, B.C., May 13.

Lillian M. Gilbreth, Montclair, N.J., May 16.

R. W. Boyle, M.E.I.C., Ottawa, May 19.

J. F. D. Withrow, M.E.I.C., Vista, Cal., May 25.

Donald R. Beckett, M.E.I.C., Fort William, Ont., May 26.

New Honorary Member of the Institute

Malcolm Pirnie

The following is the citation read at the presentation of honorary membership to Dr. Pirnie, at the recent Annual Meeting of the Institute:

Dr. Malcolm Pirnie, Hon.M.E.I.C.

The presentation of Honorary Membership is the highest honour any society may bestow. Tonight the Institute so honours one of its own members, one of its good friends, one of the most distinguished engineers of that country to the south of us which, of itself, is distinguished for its great engineers.

Malcolm Pirnie richly deserves the commendation of his friends and fellow engineers. At their hands he has been honoured many times. Outstanding among these honours is his honorary degree of Doctor of Engineering received from Rensselaer Polytechnic Institute, and the Hoover Medal presented to him only a few months ago.

The Institute is proud to join that distinguished and discerning group, in further acclaiming his outstanding character and achievements.

Doctor Pirnie is a consulting civil engineer who lives in Scarsdale and works in New York — not an unusual combination. He has been associated with many great enterprises in the field of water and sanitation. He has been consultant to private corporations, states, municipalities and the American Government both in war and in peace. His professional record is far too extensive to attempt even an outline here.

He has been a strong supporter of those societies which have won his favour. He is a past president of the American Society of Civil Engineers, The Engineers Joint Council, the American Waterworks Association and the American Institute of Consulting Engineers.

He is one of those engineers who accepts readily his civic responsibility. In Scarsdale he has served as Trustee and Mayor. He is an honorary trustee of the White Plains Hospital. For seven years he was a trustee of Vassar College. He has served on the New York University Engineering Advisory Committee, and is right now chairman of Princeton Advisory Committee to the Department of Civil Engineering, a member of a Board at Harvard and a trustee of Robert College, Istanbul, Turkey.

Dr. Pirnie's own belief is that "professional stature is one of acknowledged leadership accorded special privileges, that requires nearly equal division between professional undertakings, contributions to the advancement of the profession and service as a citizen to subdivisions of government as advisor or official".

Dr. Pirnie's record is a splendid example of the full life as it may be lived by the engineer, and is an inspiration to all, both old and young, who are privileged to know him. Truly, he has walked "The Second Mile" which the late Dr. Wickenden described as "the mile of voluntary effort", where men strive for excellence, and seek to invest their work with a wide and enduring significance.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Lt.-Col. Henry John Lamb, M.E.I.C., former Ontario supervising engineer for the Federal Department of Public Works, died on May 19, 1949, in Toronto.

Col. Lamb was a past president of Royal Military College, Kingston, Ont., a former vice-president of the Royal Canadian Institute, and a past-president of the Association of Professional Engineers of Ontario.

Born at St. Georges, Bermuda, in 1871, he attended Royal Military College, Kingston, graduating in 1893. He was subsequently engaged on geological surveys and railway surveys as assistant engineer. His early engineering work included the construction of the street railway of the city of Quebec and the erection of steel bridges and masonry substructures for Canadian Pacific Railway. In 1897 he was appointed section engineer on construction of the Crow's Nest Pass Railway for the C.P.R., and was made assistant engineer, maintenance-of-way, on the western division of the C.P.R. the following year. He joined the staff of the Department of Public Works of Canada in 1901 as assistant engineer on construction and maintenance of harbours and rivers. He was promoted to district engineer in charge of harbours and rivers in the west of Canada in 1905. From 1909-12 he was engineer in charge, representing the Dominion Government on the construction of the Detroit River Tunnel.

He served throughout the first Great War as general staff officer at headquarters, 1st and 3rd divisions, and also as assistant director on the Air Ministry in London. Col. Lamb was twice mentioned in despatches and was awarded the D.S.O. for conspicuous gallantry during operations in the field. On returning to Canada in 1919 Col. Lamb was appointed supervising district engineer for the Department of Public Works of Canada, for the Province of Ontario.

Retiring from that office, Colonel Lamb later served with the Department of Munitions & Supply as resident technical officer at the mill of Anaconda American Brass Limited, New Toronto, Ont.

Colonel Lamb has been a Life Member of the Institute since 1939. He had joined the Institute as an Associate Member in 1899, transferring to Member in 1905.

Russell Grey Swan, M.E.I.C., of Montreal, who died at his home on April 20, 1949, was prominent as a specialist in the study of water resources and the regulation of rivers.

Mr. Swan retiring in 1942 as manager of the water resources department of The Shawinigan Water Power Company, was credited with much of the responsibility for the basic hydraulic studies which resulted in the successful development of hydro-electric power on many of Quebec's rivers. His work contributed greatly to the programme by which the Shawinigan Company expects to develop, eventually, more than two million horsepower on the St. Maurice River alone.

Born at Kincardine, Ont., in 1887, Mr. Swan graduated from the University of Toronto in 1909 as a bachelor of applied science. He went west immediately in the service of the Water Resources Branch of the federal Department of the Interior, conducting hydrometric studies in Manitoba and irrigation plans in Alberta.

After taking part in the construction of the Coquitlam-Buntzen hydro-electric development near Vancouver, he rejoined the Dominion Department as chief engineer for the British Columbia and Yukon district in 1913, and for the next 12 years directed the studies which have since been used in various power developments, irrigation and flood control projects along the west coast. He joined the Shawinigan Company in 1925.

Mr. Swan was a member of the Corporation of Professional Engineers of Quebec. He became a Life Member of the Institute in 1942. He had joined as a Student in 1907 and had transferred to Associate Member in 1913, and to Member in 1940.

W. Raywood Smith, M.E.I.C., of Goderich, Ont., who had retired as Middlesex County engineer in 1946, died in hospital in Goderich on April 28 after a brief illness.

A well known conservationist, he was a consultant of the Ontario Planning Department and hydraulic engineer for the Aux Sable Conservation Authority.

Mr. Smith was born in Toronto, Ont., in 1888, was educated there, and qualified in engineering as an articled apprentice to the late F. W. Farncombe, O.L.S. He joined the Grand Trunk Pacific Railway at Fort William as a draughtsman for the division engineer, and he later served as instrumentman on construction. He was sent to the West by the Railway, and served in the Prairie Division as instrumentman on a track party, and in the Mountain Division as resident engineer. He was with the Canadian Northern Railway in 1911-12, as resident engineer on the Athabasca and Brazeau Mountain Branches. In 1913 he became resident engineer for the Edmonton, Dunvegan and British Columbia Railway.

Mr. Smith served in World War 1, with the rank of lieutenant in the R.C.E., and on his return to civilian life received the appointment as assistant county engineer of Middlesex County, Ontario. In 1940 he was named county engineer.

Mr. Smith carried on his private practice after his retirement in 1946 from Middlesex County, and he was appointed in 1947 as special consultant to the Ontario Department of Planning and Development, to act in an advisory capacity between the Department and municipal bodies in the Thames River Valley, which was being surveyed for flood control and conservation development.

Mr. Smith joined the Institute in 1918 as an Associate Member, transferring to Member in 1940.

F. B. Kilbourn, M.E.I.C., president of Canada Cement Company, died in Montreal on May 20th as a result of a heart attack. Mr. Kilbourn was at the time planning to attend the spring meeting of the Portland Cement Association at Warm Springs, Va.

Mr. Kilbourn, a prominent Canadian industrialist, was wartime steel controller of Canada, and in addition to his association with Canada Cement, was president of Canadian Refractories Ltd., and Dolmite Refractories Ltd.

He was born at Owen Sound, Ontario, in 1883. After attending public and high schools in Ontario, he came to Montreal and studied at McGill University for a year. He worked for a period with the Royal Electric Company and with the Montreal Light, Heat and Power Company.

He began his career in the cement industry with his discovery about 1904 of the adaptability of the rock formation of Montreal to the manufacture of cement and he built and operated the plant of the Lakefield Portland Cement Company. He continued to operate the plant after it was acquired by the Canada Cement Company.

He was superintendent of No. 1 Plant, Canada Cement Company, from 1909 to 1919 and acted as general superintendent from 1919 to 1939. Elected a director of the company in 1931, he was appointed vice-president in 1937, assistant general manager in 1939, general manager in 1942 and president in 1948.

For his work as Canada's steel controller during the recent war Mr. Kilbourn was invested with the O.B.E. in 1946.

Mr. Kilbourn joined the Institute as a Member in 1924, transferring to Member in 1927.

Claude Knox McDonald, M.E.I.C., of Shawinigan Water and Power Company, Montreal, passed away on March 15, 1949.

Mr. McDonald was born in Glasgow, Scotland in 1885, and received his education in that city. He served his apprenticeship in the shipbuilding industry and prior to the first World War was employed as a hull design draughtsman with Scotts' Shipbuilding and Engineering Co., Greenock. In 1919 he came to Canada and was employed in the same capacity with the Davie Shipbuilding and Repairing Company, Levis, Que.

Moving to Toronto in 1921, Mr. McDonald became associated with Walter J. Francis & Co., consulting engineers, and was engaged in research work for the Ontario Hydro-Electric Inquiry Commission. In 1923 and 1924 he worked for a time on general mechanical design for Canadian Line Materials Ltd., Toronto. Taking up residence in Montreal in 1924, he worked on electric power plant design with the same firm. He joined the Shawinigan Water and Power Co., in 1926, and was engaged in power development work until the outbreak of the second World War.

In 1941, while on loan to the Dominion Government, Mr. McDonald returned to the shipbuilding industry, joining Wartime Merchant Shipping Ltd., as hull design engineer. In 1942 he became associated with the Geo. T. Davie Shipbuilding Company, Levis, Que., and subsequently became naval architect for that firm, engaged in the construction of naval and merchant vessels. Mr. McDonald returned to the Shawinigan Water and Power Company in 1945, where he was employed at the time of his death. He had been in ill health for the last three years.

During the First World War, Mr. McDonald was commissioned as a lieutenant in the Royal Field Artillery. He saw service in various sections of Europe throughout the war years. He was wounded in action and later mentioned in despatches.

Mr. McDonald joined the Institute in 1924 as an Associate Member, transferring to Member in 1940.

J. L. E. Price, M.E.I.C., Montreal contractor and builder, passed away in Montreal on May 20, 1949, after an illness of several months. Mr. Price was president and general manager of J. L. E. Price and Company Limited, Montreal.

Born at Aberbeeg, Monmouthshire, Wales, in 1889, he was educated in public and technical schools in England and Wales, and served an articled pupilage in engineering and architecture. Before coming to Canada in 1911 he served as engineer with several British contracting firms.

His first position in Canada was with the Department of Natural Resources, Canadian Pacific Railways, and after four years there he left in 1915 to serve as a lieutenant with the Canadian Expeditionary Forces. Returning from overseas, he became assistant to the chief engineer and manager for construction of International Paper Company's mill and hydro-electric development at Temiskaming, Que.

From 1921 to 1931 he served as vice-president and director of George A. Fuller Company of Canada Limited, in which capacity he was responsible for construction of such important Montreal structures as the Royal Bank of Canada, Bell Telephone, and Dominion Square buildings.

In 1931 Mr. Price formed his own company — J. L. E. Price & Company Limited — which since that time has taken in hand many large scale peace-time and wartime contracts for such clients as the Department of Munitions and Supply; the Aluminum Company of Canada, Ltd.; Canadian Industries Limited; Defense Industries Limited; Canadian Pacific Railway Company; R.C.A. Victor Company Limited; Dominion Textiles Limited; Dominion Oilcloth and Linoleum Company Limited; Shawinigan Water and Power Company; and The Bank of Nova Scotia.

One of Mr. Price's outstanding contributions to the construction industry during late years has been the development of apprenticeship training in Quebec, through his invaluable work as chairman of the Apprenticeship Commission of the Building and Engineering Construction Trades of Montreal. He also found time to serve as chairman of the Montreal Rehabilitation Veterans' Housing Committee and as president of the National House Builders' Association. In 1947 the Canadian Legion awarded to Mr. Price the medal of Merit in tribute to his work on veteran housing.

Mr. Price joined the Institute as a Member in 1932.

John Wesley Pierce, M.E.I.C., of Peterborough, Ont., a past president of the Dominion and Ontario Land Surveyors Associations, died on March 8, 1949, after a short illness.

Mr. Pierce was born at Cookshire, Que., in 1885, and he studied engineering at University of Toronto. He qualified as an Ontario Land Surveyor and a Dominion Land Surveyor in 1909, and qualified in Manitoba in 1930. His engineering practice took him across Canada, from New Brunswick to the Great Slave Lake area of the Northwest Territories.

Mr. Pierce, from 1904 to 1912 was employed in surveying work in Ontario, and then he became a member of the firm Beatty and Pierce, engineers and surveyors, Pembroke, Ont. Mr. Pierce became employed by the Surveyor General of Dominion Lands in 1919. It was in 1920 that he received the appointment as surveyor representing Dominion and Ontario governments on the survey of the Manitoba — Ontario boundary. This work, which Mr. Pierce regarded as his most important achievement, was in 1947 retraced and extended by his son, John A. Pierce.

In 1923 Mr. Pierce was sent to New Brunswick as acting provincial supervisor for the Topographic Survey of Canada, and the next year he was appointed supervisor for Ontario, which position he occupied until his retirement from the Civil Service of Canada in 1932. Mr. Pierce at that time commenced a practice in Peterborough, Ont., in which he was active until his death.

Mr. Pierce joined the Institute in 1933 as a Member.

J. A. Laughton, M.E.I.C., who was senior consulting engineer for Stevenson & Kellogg Ltd., at Montreal, died in hospital on April 19, 1949, after a brief illness.

Mr. Laughton was born at Brandon, Man., in 1909, and studied at University of Manitoba, graduating in 1935 with the degree of B.Sc. in civil engineering.

He worked for Canadian Brown Steel Tank Co., Toronto, Ont., as an engineer from 1935 to 1938; and was a sales engineer for Lincoln Electric Co. of Canada Ltd., Toronto, Ont., in 1938-40. He then joined Hamilton Bridge Co. Ltd., as a welding engineer and shop superintendent. Two years later he came to Montreal and was with the Dominion Rubber Company for several years.

In 1946 he became an engineer for Wilson Contracting Company, and among other projects was staff engineer on the erection of the Laurentien Hotel in Montreal in 1946 and 1947. He joined the staff of Stevenson & Kellogg in 1948.

Mr. Laughton joined the Institute in 1940 as a Member. He was also a member of the Association of Professional Engineers of Quebec and of the American Institute of Tool Engineers.

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News of the Branches

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Calgary

T. M. Parry, M.E.I.C.
Secretary-Treasurer

D. C. Fleming, M.E.I.C.
Branch News Editor

The Calgary Branch of the Institute met for dinner at the Renfrew Club on April 29, 1949.

The meeting was honoured by the presence of Dean J. N. Finlayson, president of the E.I.C. and Assistant General Secretary Doug Laird.

The president and assistant general secretary are on a trans-Canada tour, meanwhile visiting the various Branches and inspecting noteworthy engineering projects in the various provinces.

The president addressed the gathering of about 100 and made some observations about the industrial scene.

The industrial expansion of Canada from coast to coast indicated a continued need for engineers; thus assuring graduating engineers of ample employment opportunities. The west might not be able to absorb all the graduates, but the industrialized east could offer plenty of employment. Opportunities for geological and chemical engineers were particularly good in Alberta's oil fields. The president said he was particularly impressed with the St. Mary Dam near Lethbridge. "It should give Southern Alberta a complete new lease on life. It will ensure stability of the agricultural industry in that area." He urged members to form a strong organization which would act in the interests of the engineering profession as the Canadian Bar Association does for the legal profession.

Doug Laird addressed the meeting briefly and told of the problems associated with the publishing of the *Journal*. He mentioned that a directory of membership, as well as an engineering products directory was in preparation. The membership is increasing at the rate of about 10 percent per year and now stands at about 12,000.

News that a prominent and popular engineer, Sam G. Coultis, would leave for Edmonton shortly, occasioned a presentation by Homer LeBourveau. Mr. Coultis has been prominent in Southern Alberta's oil industry for the past 32 years. He will assume his duties as vice-president and general manager of the Imperial Pipe Line Company, a subsidiary of Imperial Oil, Ltd. The heartfelt best wishes of his numerous friends and associates go with him.

Edmonton

E. K. Cumming, M.E.I.C.
Secretary-Treasurer

O. G. Kelly, M.E.I.C.
Branch News Editor

At an evening meeting held jointly by the Edmonton Branch of the E.I.C. and the local branch of the M.E.A.C. in the Garrison Officers' Mess of the Prince of Wales Armouries on Thursday, April 14th, Major-General Howard Kennedy, Ottawa, consulting engineer, presented a paper dealing with **Forest Management on the Eastern Slopes.** Branch Chairman H. W. Tye presided. General Kennedy was introduced by Lt.-Col. J. S. Beeman, who traced the speaker's career in forestry engineering up to his present appointment as chairman of the Eastern Rockies Forest Conservation Board.

The speaker commenced by explaining that forestry is a very broad field, and affects our daily life in many ways. He stated that the main function of forests is to equalize stream flow. They also act as a habitat for wild life, and they prevent erosion. These are the long-term benefits which we derive from them. The short-term benefits consist of forest products.

General Kennedy quoted statistics to show the place of forestry in the world. He stated that the total forested area of the world is 25 per cent of the land area, and that world use at present amounts to 600 million cords annually. There are enough forests in the world, he said, to last indefinitely if managed wisely.

Dealing with erosion, the speaker said that in his estimation, steady erosion of agricultural land throughout the world constitutes a threat to world peace more serious than Communism or the Atomic Bomb.

Turning to his work with the Eastern Rockies Forest Conservation Board, General Kennedy stated that it had as its chief object the regulation of the spring run-off in order to offset the shrinkage of the glaciers, from which approximately 50 per cent of the summer flow of our larger prairie rivers is now derived. The first stage is to protect the forests already there and to this end a start has been made on a trunk road running the entire length of the Conservation Board area. The Board is also studying the effects of grazing in certain areas and is experimenting with the growing of trees. In closing the speaker warned against expecting quick results and stressed the importance of public interest and co-operation in making forest conservation effective.

After an interesting discussion, F. R. Burfield moved a vote of thanks to the speaker, which was heartily endorsed by the 62 members and guests present. Refreshments, served by the Mess staff, ended a very enjoyable evening.

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Sixty-three members were in attendance at the Annual Meeting of the Edmonton Branch held on Monday, April 25, 1949, in the MacDonald Hotel. The meeting took the form of a dinner, followed by a business session and smoker. H. W. Tye acted as chairman. During the dinner period the chairman presented engraved silver steins to the following local members who had presented papers to the branch during the year: Dean R. M. Hardy, for his address entitled "A Report on the Second International Conference on Soil Mechanics and Foundation Engineering" — Messrs. C. Z. Monaghan and S. J. Hampton, for their paper entitled "The Underground Electrical Distribution Network for the City of Edmonton" — and Mr. G. R. MacLean, for his paper entitled "Synthetic Resins and Some of Their Applications".

Reports covering branch activities during the past year were presented. An increase in membership was reported, from 266 at April 30th, 1948, to 367. In addition to these members it was reported that 45 students had made application but had not as yet had their applications approved by Council.

After discussion of matters on the agenda, elections took place which resulted in the following list of Branch officers: Chairman, T. W. Dalkin; Vice-Chairman, E. H. Wright; Secretary-Treasurer, E. K. Cummings; Executive, O. G. Kelly, W. I. McFarland, E. L. Smith, H. A. Carswell, T. C. Main, R. E. Phillips; Auditors, D. K. Campbell and H. Hole, Jr.

The retiring Chairman then turned over the meeting to Mr. Dalkin and the business session was adjourned.

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On May 14th one hundred and ten members of the Edmonton Branch and their guests were conducted on a tour of the newly constructed Imperial Oil Refinery at Edmonton.

Members met in the Administration Building at the refinery and H. H. Moore outlined the history of the plant and described some of the highlights of its transportation from Whitehorse to its present location.

J. A. Sidervan, production controller, and A. L. Scott, chief clerk production control, gave brief lectures on the processing and the general description of some of the equipment and their functions.

Members were then divided into four groups and conducted on a tour of the entire refinery. The tour was considered by all members very successful and enlightening and it was felt special mention should be made of the following members of the staff of the refinery: H. H. Moore, superintendent; E. S. Davis, assistant superintendent; A. Mira, process superintendent; B. H. Sherwood, plant maintenance engineer; D. E. Pittard, chief chemist; J. A. Siderван, production controller; H. J. Rae, technical superintendent; W. Anderson, production control engineer; A. L. Scott, chief clerk production control.

Mr. Scott is a lecturer at the University of Alberta and is employed with the Imperial Oil Company during his vacation periods.

Halifax

M. L. Baker, M.E.I.C.
Secretary-Treasurer

A. R. Harrington, M.E.I.C.
Branch News Editor

A very interesting paper on **Radiant Heating** was presented to the February meeting of the Halifax Branch of the Institute by G. Lorne Wiggs of Montreal.

Mr. Wiggs explained how radiant heating crept up on us in Canada without very much notice being taken of it. He explained that coils installed in the ceiling of a building must emit heat by radiation; this heating being similar to electro magnetic and sound waves, warms anything in the path of the wave similar to the sun's action on the earth.

Some radiant heating systems are installed in the floors, but this method also sets up convection currents to heat the room. Radiant heating installed in the ceiling has advantages over that installed in the floor in that the ceiling changes temperature more quickly, due to the small plaster covering over the coils compared to the large concrete covering that would be over coils installed in the floor.

Some of the advantages of radiant heating are that we may operate with lower room air temperatures, lower temperature gradients between the floor and ceiling, better humidity control and lower fuel consumption. Temperature control is a difficulty with thermostats in the building and some installations use a thermostat outside for 80 or 90 percent control with trimmer thermostat control inside for 10 percent.

Mr. Wiggs stated that on buildings costing between $25,000 and $50,000 radiant heating will about break even in cost compared to the more common types in use. In larger buildings however, hospitals, apartment houses, etc. Radiant Heating installations will cost about 15 per cent less.

C. D. Martin extended a vote of thanks to the speaker on behalf of the members present.

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The development of electronics is "the greatest aid to navigation since the discovery of the compass," James H. Rowlett, vice-president and general manager of the firm of Cossor (Canada) Limited, told a meeting of the Halifax Branch of the Engineering Institute of Canada on March 22, 1949, at the Lord Nelson Hotel. Speaking on the subject **Electronic Aids to Navigation,** Mr. Rowlett described in vivid detail several systems of the application of electronics to navigation and predicted that it would be of tremendous value to navigation both at sea and air in the future.

Mr. Rowlett outlined the problems of navigation both for marine craft and aircraft and stated that during the recent war, many aids to navigation had been developed. By the stimulus of the war, he added, the application of electronics to navigation had been developed considerably.

Although radar is not being used to a great extent in Canada as yet, since it had only been brought into use during the war, he termed it "the coming thing" and said that the combination of Radar and LF Loran might very possibly be the answer to the long range anti-collision device.

During his address, Mr. Rowlett described in great detail the operations of various systems of electronics in navigation, including Radar, Loran, Consol and Decca, and outlined the many advantages and problems that were involved. One by one, he broke down their various steps in transmitting messages to either sea or air craft and the various methods employed in sending out signals by either continuous waves or pulse transmissions.

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The April meeting of the Halifax Branch was held at the Lord Nelson Hotel, April 28th. Dr. R. O. Jones, professor of psychiatry, Dalhousie University, lecturer in industrial psychiatry at Nova Scotia Technical College, and psychiatrist at the Victoria General Hospital, Halifax, presented a paper on the **Importance of Human Relationship in Industry.**

The speaker stated that just as doctors must consider people rather than a collection of pieces and parts of an anatomy, engineers must realize that all machinery and equipment is run by people. Thus their behaviour is important to industry. The chief problem of a psychiatrist is to prevent bad behaviour in a general way, rather than cure individuals of the results of bad behaviour. Behaviour depends upon an individual personality facing a particular situation. If situation and the personality are known, behaviour can be predicted. Usually the situations are known, so the job is to study the personality, which must be considered under three general aspects: physical characteristics, intelligence, and emotional growth.

In placing a person in a job, care should be taken to see that the job fits his personality needs for prestige, sense of accomplishment, security, and hope of advancement. This requires considerable study by management, as in modern industry there is little opportunity for satisfaction to the employee, as he seldom sees the completed article on which he has done partial work and it is hard for him to realize his importance to the completed project.

Dr. Jones described the very interesting experiment undertaken by the Western Electric Company several years ago, called "The Hawthorne Experiment".

Not all the work to be done in this field is to be expended on the employee, but management itself can often cause trouble, so that management itself should look to its job personality. The first signs of poor behaviour, due to insufficient attention being paid to the personalities of the workers show up in absenteeism, employee unrest and low productivity.

Dr. Jones concluded by saying that tests are very effective in showing persons not suited for a particular job, but they don't necessarily show the person best suited.

Considerable discussion occurred after the presentation of the paper and Chairman M. L. Baker conveyed a vote of thanks to the speaker on the motion of Mr. L. J. Archibald.

Hamilton

I. M. Macdonald, Jr.E.I.C.
Secretary-Treasurer

J. H. Mitchell, Jr.E.I.C.
Branch News Editor

The regular monthly meeting of the Hamilton Branch was held on February 17, 1949, in the Science Lecture Theatre, McMaster University, Chairman Neil Metcalf presided, and 40 members and guests were in attendance.

The speaker, J. J. Kelly, was introduced by H. Thomasson as the Hamilton district manager of the Lincoln Electric Company of Canada, and a well known authority on welding and welding problems. Mr. Kelly's talk was entitled **Arc Welding and Related Construction Design.**

The speaker began by pointing out that fabrication by welding had been proven and is now accepted as a standard method of construction. He cited as examples the floating harbour Mulberry, Bailey Bridges, and the oil supply line Pluto, used by the armed forces in invading Europe, which were speedily fabricated by welding. These were, he said, completely satisfactory from a structural point of view, and were built with a minimum of labour and expense.

Welded construction has many advantages, such as lightness, cheapness, improved appearance, and speed of fabrication, continued Mr. Kelly. He pointed out the many improvements that had been made in welding techniques to keep pace with new designs, and outlined some of these with the help of a very interesting sound film.

After a question period, the speaker was thanked by W. B. Nicol, and the meeting adjourned for the customary refreshments.

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About 130 people were present at the annual joint meeting of the Hamilton Branch of the E.I.C. and the Toronto section and Hamilton sub-section of the American Institute of Electrical Engineers at the Westinghouse West Plant in March.

Neil Metcalf, chairman of the Hamilton Branch of the E.I.C., who presided, said that he felt that nothing but good could come from those joint meetings, as they enabled engineers of various branches to get together and understand each other's point of view.

E. M. Coles, vice-president and director of engineering of Canadian Westinghouse Company Limited, welcomed the gathering on behalf of the company.

J. F. Moore, chairman of the Toronto

section of the American Institute of Electrical Engineers, also spoke.

A. A. Moline, chief engineer of Canadian Westinghouse Company Limited, introduced the speaker J. E. Barkle, of Westinghouse Central Station Department, Pittsburgh, who described the various electrical power distribution systems.

A vote of thanks was proposed by A. W. Murdoch.

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The Hamilton Branch of the Institute held its April meeting on Thursday, April 21, 1949, at McMaster University Lecture Theatre.

The members assembled to hear a talk by W. J. W. Reid, president of Otis-Fensom Elevator Company and vice president of Engineering Institute of Canada. His subject was **Organizing a New Plant.**

Special guests of the evening were Hamilton and District members of the Association of Professional Engineers of Ontario, of which Mr. Reid is president.

Chairman Neil Metcalf, opened the meeting by stating the reason for the assembly and extending a welcome to the members of the Professional Engineers of Ontario.

He asked Colonel T. M. Medland, executive director of the Association of Professional Engineers of Ontario, to say a few words to the audience. Mr. Medland was followed by C. E. Sisson, who was recently appointed field secretary of the E.I.C.

John Elliott introduced the speaker of the evening.

Mr. Reid opened his address by stating that for the sake of clarity he would follow a pattern of presentation in which the audience should assume that it was an individual called into the office of the director of a large industry where he is informed that he has been selected as manager of a new plant.

The lecture followed as direction and advice from the director to the nominee.

Under the heading "Locality and Size" the director said, "The old theory, that the larger the plant the greater the economics, has fallen into disfavour, and has been replaced by the theory that a plant under the direction of one manager who has a grasp of all operations showed greater economics." He went on to indicate ways in which the new theory should be applied to a new plant.

A lively discussion followed, hinging on building types, incentives and rates.

The "director" advised his new manager on the matter of profit.

Free enterprise only works under the profit system and those operators who do not make a profit will soon find that they are replaced by other people in the competitive system.

Today, when many people's minds are being filled with community and co-operative effort, state communism and socialism, they are beginning to feel it is wrong to make money. Therefore, start at the beginning to get the employees under your direction profit conscious.

Great labour leaders like Green and Murray who rarely miss an opportunity to bait big business, have on many occasions expressed themselves in favour of the profit system and opposition to socialistic system.

L. C. Sentance thanked the speaker on behalf of the assembled group for the very thought provoking lecture and extended a very hearty vote of thanks.

Neil Metcalf extended an invitation to the audience to share in sandwiches and coffee, and adjourned the meeting.

Kingston

D. L. Rigsby, M.E.I.C.
Secretary-Treasurer

J. T. Provan, Jr.E.I.C.
Branch News Editor

On Tuesday, May 3, 1949, the Kingston Branch held a meeting in the Biology Lecture Room, Old Arts Building Queens University.

The guest speaker was Lt.-Col. P. G. F. Young, O.B.E., British Army Directing Staff, Army Staff College, Kingston, and was introduced by Lt.-Col. W. S. Hunt, Officer Commanding R.C.E.M.E. School, Barriefield.

The subject chosen was **Palestine During the Latter Days of the British Mandate.** Lt.-Col. P. G. F. Young has spent some time in the East and gave a first hand account of the events leading up to the dissolving of the British Mandate. In the course of the speech the speaker discussed the topography of the land, the history of the people, the living conditions of the people, the military aspect, and the final partition of Palestine by the U.N.O.

After a discussion period, M. G. Saunders, plant engineer at Kingston Works of the Aluminum Company of Canada, Ltd., thanked the speaker and the meeting adjourned.

Lethbridge

D. Cramer, Jr.E.I.C.
Secretary-Treasurer

The visit of President J. N. Finlayson and Assistant General Secretary W. D. Laird to the Lethbridge Branch of the Institute was marked by a very successful field tour and dinner on April 28, 1949.

The field tour left Lethbridge at 11 a.m. and visited the Pothole Dam which is part of the St. Mary-Milk River Development, and then went on to the St. Mary Dam site which is now under construction by the P.F.R.A. The party was conducted by W. L. Foss, branch chairman and supervising construction engineer for the project.

Lunch was held at the W. C. Wells Construction Company Camp Dining Room with the members and visitors as guests of the Company.

The party returned to Lethbridge and the dinner meeting was held in the Marquis Hotel, with W. L. Foss in the chair.

The branch was also host to a large group of American and Canadian Engineers who were attending a meeting of the International Joint Commission.

Dinner music by Brown's musical trio, community singing led by R. S. Lawrence, and vocal selections by Miss Ella Finlay, Miss Laverne Cummings, and Mr. Art Hunt were very much enjoyed.

K. F. Vernon, regional director of the U.S. Bureau of Reclamation at Billings, Montana, spoke briefly on the work of the International Joint Commission.

W. D. Laird, assistant general secretary of the E.I.C., spoke on affairs of the Institute and informed members of proposed changes in the Journal. He spoke of the services of the Library and employment Bureau, and of the appointment of Field Secretary C. E. Sisson.

Dr. Finlayson was introduced by C. S. Clendening and outlined the highlights of his term of office. He spoke of the important work that the Institute is doing, and emphasized the need for an engineer on the International Joint Commission.

R. S. Lawrence moved a note of thanks to Dr. Finlayson for his address.

The meeting was one of the most successful ever held by the Branch.

Niagara Peninsula

H. L. Weaver, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

A regular meeting was held on April 21st, in the Merritt Room of the Barclay Hotel, at Welland, Ont.

Following dinner, Chairman R. A. Coombes called on E. R. Zacharias, who introduced J. A. Whittaker, sales engineer of the Joseph Stokes Rubber Co., Welland.

Mr. Whittaker spoke on the subject of **Plastics and Hard Rubber Products As Applied in Industry To-day.** He explained the chemical composition and named the ingredients which are used in the manufacture of various hard rubber products, many of which are manufactured in Canada by Joseph Stokes Rubber Company only. Several of the engineering problems involved in the manufacturing process were explained and a number of the uses of the products were illustrated. The speaker also elaborated on plastic products as produced by his firm and a number of samples of the latter were on display. The range of products discussed included bowling balls, buttons, garden hose and ladies' hose (rayon), radio cabinets and others.

Following the usual discussion period a vote of thanks was tendered to the speaker by P. E. Buss.

Samples of the products discussed were left on the table for inspection by the members at the close of the meeting and these added considerably to the interest and to the discussion of the subject.

Ottawa

J. C. Elliott, M.E.I.C.
Secretary-Treasurer

Capt. A. Bernard, M.E.I.C.
Branch News Editor

The regular luncheon meeting of the Ottawa Branch was held at the Chateau Laurier on the 21st of April, 1949.

Members of the Canadian Institute of Mining and Metallurgy also attended this meeting.

The speaker for the occasion was Robert H. Saunders, C.B.E., K.C., chairman of the Hydro Electric Power Commission of Ontario. Mr. Saunders gave a very interesting talk on the conservation and use of natural resources in Ontario.

The speaker was introduced by Frank Plant, commissioner with the Hydro Electric Power Commission of Ottawa. G. C. Monture, chairman of the Canadian Institute of Mining and Metallurgy, ably thanked the speaker for a very instructive and interesting talk.

Others at the Head Table were: A. A. Swinnerton, chairman of Ottawa Branch of E.I.C.; A. A. Richardson, project manager at Des Joachims; F. G. Rutley, vice-president, Foundation Company of Canada; C. S. Parsons, chief, Bureau of Mines; Marc Boyer, Deputy Minister of Reconstruction and Supply; W. M. Goodwin. Secretary of C.I.M.M.; G. C. McRostie, of the Management Committee, Ottawa Branch E.I.C.

Peterborough

M. M. Uloth, M.E.I.C.
Secretary-Treasurer

J. C. Allan, M.E.I.C.
Branch News Editor

J. T. Purvis, engineer in charge of Turbine Design Section of the Gas Turbine Engineering Division, A. V. Roe Canada Ltd., delivered a lecture on **Jet Aircraft Engines** on April 21, 1949. A capacity audience was present at the Public Library Auditorium to hear this lecture.

The several types of jet engines were described to show the place of the gas turbine type of jet engine, and the following discussion was centred on it, with particular reference to the Avro Canada "Chinook".

Following a short history of gas turbine work in Canada, Mr. Purvis showed a sound film to explain and illustrate the general principles of jet propulsion, a general study of centrifugal engines, a study of axial engines, and a description of the Avro Canada "Chinook".

One of the first considerations of an aircraft power plant is weight, and in this regard the gas turbine jet engine is superior, being about half the weight of its reciprocating engine counterpart. Another advantage is that it does not have large numbers of moving parts, consisting as it does of one main rotor assembly with two or three auxiliary gear boxes. This greatly decreases the number of things that can go wrong.

Jet engines, being balanced to close limits, give very smooth vibrationless operation. They have a very low oil consumption. In Jet propulsion, also, very high powers can be built into limited volume with small frontal area.

It is however in the realm of high speed flight that gas turbine jet engines come into their own. The propulsion efficiency of the conventional propellor decreases very rapidly at speeds in excess of 400 m.p.h. This is not surprising if it is realized that the blade tips are slicing the air at speeds approaching the speed of sound.

The efficiency of a jet engine is a function of its forward speed, so that its efficiency curve continues to rise steeply past 400 m.p.h. Its high fuel consumption therefore can be tolerated.

In addition the gas turbine engine does not require the use of expensive high octane fuels. Kerosene is the ordinary fuel but they have also been run on fuel oil.

Mr. Purvis showed a series of slides to illustrate the functioning and the parts of the gas turbine engine. His very complete description of the "Chinook" engine brought home the nature of the jet engine to the audience and difficulties in its construction.

Following a question period, Mr. Purvis displayed a collection of engine parts.

On May 5th, A. L. Malcolm, until recently resident engineer at the H.E.P.C. Des Joachims development, delivered a paper to the Peterborough Branch on the subject of the **Design and Construction Features of the Des Joachims Development.** Sixty-five members and guests were present.

Mr. Malcolm commenced by explaining that present conditions have made it necessary for the Ontario Hydro-Electric Power Commission to turn its attention to the development of those power sites which are within easy reach of the Commission's transmission network so that they may provide reasonably large blocks of power within the next two or three years.

A study of the power surveys since 1942 showed the place of Des Joachims in the general scheme. Delays with respect to the St. Lawrence made it imperative that further development of the Ottawa river be completed at an early date. An early survey by the Dominion Government, Department of Railways and Canals, relative to the proposed Georgian Bay canal was the starting point of the Des Joachims studies and if the Georgian Bay canal ever becomes a reality, the headwater and tailwater levels to be established at Des Joachims will conform to the regulated levels which would be required for that proposed waterway.

The Rapides des Joachims development, when complete, will comprise the installation of a station of 480,000 horsepower, consisting of 8 units of 60,000 horsepower each.

A series of slides were shown to illustrate the various construction stages and methods employed. The use of surplus war assets, Bailey bridging for temporary structures was illustrated and explained. This material is salvageable and may be used on other work in the future.

Disposal of flood water, supplementary contracts for highway construction, railway relocation, etc., were described as well as the installation of very extensive rock crushing, screening, and aggregate storage facilities.

The meeting concluded with a coloured motion picture to illustrate the recent construction projects undertaken by the H.E.P.C. all over the province.

Following a lively question period, a vote of thanks was moved by H. R. Sills.

St. Maurice Valley

G. W. Ince, Jr.E.I.C.
Secretary-Treasurer

J. G. MacLeod, M.E.I.C.
Branch News Editor

Science and Living was the title of an address by J. T. Thwaites, electronics engineer of Canadian Westinghouse Company at the annual meeting of St. Maurice Valley Branch on April 29th, at Three Rivers.

The meeting was attended by A. Lariviere, vice-president of the Institute, and P. Vincent, chairman of the Quebec Branch, who described the Annual General Meeting of the Institute at which the Quebec Branch would be host. Prizes were presented to E. A. Love and W. G. Seline for the best papers prepared by Juniors and read at a recent meeting. H. K. Wyman of the nominating committee announced the results of the election of officers for the forthcoming season: chairman, S. E. Williams; vice chairman, R. E. Kirkpatrick; secretary-treasurer, J. B. Edwards; committee men. C. H. Neil, A. H. Watier, G. R. Goring.

A. Davison introduced the guest speaker as one of Canada's leaders in electronics. After discussing the law of averages as applied to the origin of life Mr. Thwaites sketched the time span of evolution to emphasize the vast improvement of creature comfort which science has obtained for man in recent decades, and predicted that a 20-hour week for labour was probable in view of the increasing efficiency of output in industry. The sources of both hydro and thermal power are unequally distributed with respect to population but the industrial application of atomic energy will give all countries an equal chance for industrial development by atomic power plants and may be an important link in forging a lasting peace although its effect may not be felt for many generations. Since men's consumption of power in industrial countries is increasing by 5 to 10 per cent per year, and since conventional power sources are limited, the discovery of atomic energy has come at a propitious time, a further proof of the hand of a Master Planner.

The address was followed by a Walt Disney cartoon, issued by Westinghouse, illustrating the improvement in living standard over the past 300 years.

After a brief discussion period Professor H. O. Keay thanked the speaker.

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Patents was the subject of a very interesting talk presented to the St. Maurice Valley Branch by Dr. A. H. Heatley, director of patents of Shawinigan Chemicals Limited, on February 22 in Shawinigan Falls. Dr. Heatley gave a general outline of the subject and indicated what inventors had to go through in order to obtain patents on their inventions. He also pointed out, with the aid of some very humorous slides, the difficulties which beset patent agents in their daily tasks. To conclude his lecture he showed slides of interesting patents including some on plants and fruit.

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One of the best attended meetings of the year was held in Three Rivers on March 23rd, when W. H. Durrell of Labrador Mining and Exploration Company spoke on **The New Quebec-Labrador Iron Ore Development.** The meeting started with a 30 minute film showing the locale and scope of operations undertaken so far. Twenty-four holes have been drilled to date which have proved some 320 million tons of ore located within 300 ft. of the surface with little overburden, so that it can be reached by open-pit mining. All equipment used in the exploratory work was flown to a central point and distributed by roads to the various drilling sites. Mr. Durrell went on to say that an expenditure of approximately $200 million will be required to get operations started. This includes loading facilities at Seven Islands, 320 miles of railroad, and a 25,000 h.p. power development at Eaton Canyon. He estimated that the mine could be in operation within four years of the start of the railroad.

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On April 6th a "Junior Night" was held in co-operation with the Junior Section in Shawinigan Falls. Six junior members contested for prizes presented by the Branch Executive for the two best papers. The following is a list of speakers and their subjects: **Drying of Solids** by D. G. Demianiw, Shawinigan Chemicals Limited; **Radiant Heating by Hot Water** by A. E. A. Love, Consolidated Paper Corporation Limited; **Distribution System Voltage Conversion with Particular Reference to Shawinigan Falls** by W. R. Mackay, Shawinigan Water and Power Co.; **Power Developments on the Winnipeg River** by R. J. MacLean, Aluminum Company of Canada; **Some Features of Modern Transformer Design** by W. G. Seline, Shawinigan Water and Power Co.; and **Statistics — a Tool for the Engineer** by W. H. T. Wilson, Canadian Industries Limited. After some minutes of consultation the judges selected Messrs. Love and Seline as the winners of a close contest.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bing-Wo, M.E.I.C.
Branch News Editor

A meeting of special interest was held on Monday, May 2, 1949, at the Hotel Saskatchewan on the occasion of the visit of President J. N. Finlayson and Assistant General Secretary W. D. Laird. This meeting coincided with "Ladies Night", and proved to be one of the outstanding meetings of the year.

Mr. Laird dealt briefly with Institute affairs. Regarding *The Engineering Journal*, he pointed out that the *Journal* in trying to serve the entire field of engineering is trying to do a job which in the United States requires a considerable number of specialized publications. The whole matter of the *Journal* is now under study by the publications committee who will draw up a brief in a short time. The advertising appearing in the *Journal* is necessary to help defray the cost of publication which runs to nearly $5,000.00 per month. Some branches had expressed the desirability of having Transactions published but up to the present time Council has not seen that it was possible.

Mr. Laird also mentioned that the publishing of a Membership Directory was to be made separate from the *Journal*. Announcement was made as to the formation of branches of the Institute in the central B.C. area, the Kitchener-Guelph-Galt area and Newfoundland. The appointment of C. E. Sisson of Toronto as field secretary was also announced.

Dean Finlayson spoke of the observations he had made in his presidential tour. It was noted in all places that a spirit of optimism for the future prevails. Among the indications of an expanding industrial and agricultural development, Dean Finlayson noted the increasing demand for aluminum produced at the Arvida plant in Quebec; the search for hydro power sites in British Columbia; the St. Mary Irrigation scheme in Southern Alberta, along with a huge hydro development for the Calgary Power Co., on the Spray River; the large scale irrigation scheme being planned in Saskatchewan. Other signs of expansion in other provinces of Canada were mentioned by Dean Finlayson. He also paid tribute to the engineers of the country who are playing such an important and essential role in this growth.

Toronto

R. A. Muller, Jr.E.I.C.
Secretary-Treasurer

Junior Section

R. C. Harris, S.E.I.C.
Secretary

The weekend of April 23 was the occasion of a coach field trip to the Des Joachims Development, on the Ottawa River. The trip was made possible by the courtesy of the Hydro-Electric Power Commission of Ontario, and was made a success by the energetic leadership of their field staff, particularly that of Mr. W. M. Hogg, the resident engineer.

The party of 29 members was fortunate in seeing every piece of equipment on this large project in operation on Saturday.

Other interesting points studied were the cableway and its unique hoisting arrangement on the block, the bridge for the closure gantry, the pipeline for pumping dry cement to the Quebec mixer, the cofferdams and the powerhouse section, rock excavation, and the main dam. A visit to the gravel pit, and the aggregate crushing, scalping, screening, and storage plant gave an indication of the quantities involved (860,000 cu. yds.).

The control dam at McConnell Lake was inspected also. The concrete monoliths here are poured in form cages of Bailey Bridge material, in lifts of about 50 ft.

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At the April 27 meeting of the Junior Section, the results of the preferential ballot for the 1949-50 executive were announced.

The chairman elect, T. H. Ivory, had all members present give their suggestions on the type of meetings to be held in the coming year. There was a slight preference for more field trips. The past year's activities were reviewed by the retiring officers.

The guest speaker was M. J. C. Lazier, professional engineer and consultant, who delivered a most intriguing talk on **Mathematical Analogies Useful in Business.** This was a subject of general interest.

Starting from a discussion of rates of change and flow in electricity, hydraulics, and thermodynamics, Mr. Lazier showed how these concepts could be applied to the movement of money.

The mortality of capital goods has a typical time curve, with periodic damped oscillations of replacement. Intelligent study of the morphology of business economics could lead to great savings by avoiding the replacement maxima.

A great deal of other interesting matter on this new area of thought was discussed.

The meeting closed with a barrage of questions, during which the speaker gave a short bibliography.

Mr. Lazier was introduced by D. MacDonald, and thanked by R. C. Harris.

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The stag party (Salami Soiree) was enjoyed by 50 members on the evening of March 29, 1949, at the Oddfellows Hall. It proved to be a very successful party, and gave to the proponents of social gatherings just what they had been demanding.

While the refreshments were liquidated, there were singsongs, music on piano and guitar, and magic by Reg. Carson.

Vancouver

Alan Fletcher, Jr.E.I.C.
Secretary-Treasurer

Stuart S. Lefeaux, Jr.E.I.C.
Branch News Editor

The Annual Presidents' Banquet of the Vancouver Branch was held at

Toronto Branch Junior Section at Des Joachims. In the background is part of the main dam, and the interprovincial span of the concrete conveyor bridge.

Hotel Georgia on Friday, April 22nd. Approximately eighty members attended to honour President J. N. Finlayson and Assistant General Secretary W. D. Laird who were paying the annual "official visit".

Chairman George Allan opened the after-dinner meeting with a few remarks concerning the branch charter.

Two excellent films were shown; the first, "Bridge River", a B.C. Electric Railway Company film of interesting scenes during construction; the second film was "Operation Overflow", which showed highlights of the Fraser River Valley flood of 1948.

Mr. Allan introduced W. D. ("Doug") Laird to branch members. Mr. Laird was making his first visit to Vancouver as the assistant to Mr. L. Austin Wright. Mr. Laird gave a report on the *Journal* publication; the problems of advertising, space utilization, circulation, housing and finance were discussed. Mr. Laird also reminded members of the literature research service and the 14,000 volume library at Headquarters, facilities of which are available to members. He also commented on the work of the publications committee, which was endeavouring to establish a fund for the publication of technical papers in pamphlet form.

President Finlayson formally thanked his fellow branch members for his election and gave a resume of his recent visit to the branches. He referred to the strong feeling of national pride found in all the provinces visited and of the many large industrial developments that are meaning greater wealth for all Canadians. The President also stressed the main problem of the need for unity of the profession throughout the Dominion. The Institute membership should be expanded to represent all practising engineers in Canada so that it may speak with a truly national voice for the profession in all matters affecting the welfare of engineers. Unification of registration standards throughout the Dominion is necessary to strengthen the profession in its work for the engineers.

Bill Kelly, branch councillor, thanked the president and Mr. Laird for their inspiring talks and wished them good luck on their trek eastward to the annual meeting at Quebec.

Chairman George Allan and Mrs. Allan entertained the President and Mr. Laird at their West Vancouver home on Saturday, April 23rd, when members of the branch executive and wives had an opportunity to meet President Finlayson and Mr. Laird informally and chat about Institute affairs.

Victoria

D. A. MacLean, Jr.E.I.C.
Secretary-Treasurer

T. A. J. Leach, M.E.I.C.
Branch News Editor

The Victoria Branch held its annual banquet at the Empress Hotel on Wednesday, April 20th, when they were host to Dean J. N. Finlayson and Mr. W. D. Laird. This was the first point of the presidential tour which took the president eastward across Canada and terminated at the Annual General and Professional Meeting in Quebec in May.

R. Bowering, the Victoria branch chairman, presided at the meeting and introduced Mr. Laird, assistant editor of *The Engineering Journal*.

Mr. Laird in discussing Institute growth pointed out that of a total eligible list of 25,000 engineers in Canada, about 12,000 are members of the Institute. Strength for expansion and increase of membership must come from within. For this, the members themselves must be convinced of the benefits and advantages of belonging to the Institute. This includes tangible values such as reduced rates on various foreign Engineering Society Publications, access to the technical library at Montreal including bibliographies and literary searches, *The Engineering Journal* with its employment service, and the various professional meetings on technical subjects. Probably one of the most important advantages, and one whose value cannot be assessed, is membership in a national organization which is in contact with nearly every phase of public life.

Following Mr. Laird, Dean Finlayson was introduced by Dr. Gray who gave a brief summary of President's education and professional accomplishments.

The distinguished engineer, who has held important company and government engineering posts across Canada and in the United States, sketched a glowing picture of the Dominion's future as new mining and engineering developments across the country come into being.

The speaker pointed out the important role the engineer is playing in these developments, and with it the need of one national professional organization to represent the Canadian engineer. In concluding, Dean Finlayson said "The people have a right to expect some unified opinion. We should forget regional differences and concentrate on the formation of such a council."

Kenneth Reid thanked the President for his entertaining and lively address and asked that he convey the best wishes of the Victoria Branch to the members at the annual meeting in Quebec.

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On Sunday, April 10th, members of the Victoria Branch, with their wives, left the city by car enroute for the John Hart Power Development on Campbell River.

At noon, the trip was pleasantly interrupted by a luncheon at the Malaspina Hotel, Nanaimo, where the travellers were guests of the B.C. Power Commission. Mr. Garth Griffith, the regional superintendent for the Commission at Nanaimo presided over the luncheon programme.

Dean J. N. Finlayson, president of the E.I.C., accompanied the party and expressed delight in the expansion he had noted in Nanaimo. Other visitors to the luncheon included Mayor George Muir of Nanaimo, S. R. Weston, chairman of the Power Commission, Reeve Chapman of North Cowichan, and J. C. Spur of the Nanaimo Board of Trade.

In the afternoon the party continued north to Painters Lodge at Campbell River, with a few stopping off at Courtenay.

On Monday morning under the guidance of G. A. Vandervoort, chief operating engineer of the B.C. Power Commission, a tour was made of the John Hart Hydroelectric Development.

This project, located on Campbell River, was described in detail by Kenneth Reid, M.E.I.C., in the December, 1948 issue of the *Journal*.

Construction of the storage dam at Ladore Falls to raise the water 58 ft. in Lower Campbell Lake is well under way and two rectangular sluice gates are already in place. During its construction the river has been diverted by a tunnel through the south bank.

The main dam further downstream has been completed. It diverts water through the adjacent intake structure which in turn connects with a 12 ft. diameter woodstave penstock. A second penstock of the same size is under construction and eventually a third one will be built.

No. 1 penstock changes to a 12 ft diameter steel pipe just before dropping abruptly to the power house. Here it terminates in a steel wye, the branches of which feed No. 1 and 2 turbines. These two units of 28,000 hp. each have been in operation over a year.

It is expected that the second penstock, its surge tank, and the corresponding 3 and 4 units will be in operation early this summer.

Following the morning tour the party was the guest of the General Construction Company at a luncheon held at the camp. H. V. Serson, project manager for the Company, presided.

In his closing remarks, R. Bowering, Victoria Branch chairman, gave thanks both to the B.C. Power Commission and the General Construction Company for their hospitality and for the well planned tour.

It seemed to be the opinion of members that the Campbell River trip had been one of the outstanding events of the year.

Winnipeg

G. W. Moule, M.E.I.C.
Secretary-Treasurer

Electrical Section

J. C. Pratt, M.E.I.C.
News Editor

The last meeting of the season was held May 5, with R. Noonan presiding over the gathering. The speaker was Mr. Paul Shane, operating engineer with the Manitoba Power Commission. The subject on which he spoke was, **Fuse Co-ordination in Rural Lines.**

Mr. Shane outlined the problems associated with providing optimum service to a proposed 50,000 farms spread over an area of 30,000 sq. miles and the steps the Power Commission were taking to solve these problems. A major endeavour is to prevent the burning of fuses on transient faults by the judicious use of circuit reclosers. Experience to date indicates that reclosers on the system pay for themselves in an average period of six years by reduced replacement of fuses alone, and at the same time provide a more continuous service.

The operating characteristics of circuit reclosers, fuses, sectionalizers and equalizing breakers were outlined, and an active discussion followed.

The speaker was introduced by R. Tivy, electrical engineer, Manitoba Power Commission, and an expression of thanks to Mr. Shane was moved by L. A. Bateman, operating engineer, Winnipeg City Hydro, at the close of the address

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CIVIL

CIVIL ENGINEER with a minimum of ten years construction experience particularly hydro-electric power projects required in Toronto. Salary open. Apply to File No. 1173-V.

CIVIL ENGINEERS required by large organization with headquarters in Toronto. To take charge of design and construction of small timber and concrete dams and maintenance and operation of locks and dams, etc. throughout the Province of Ontario. Applicant must have at least several years experience on construction of timber and concrete dams with sluiceways, etc. Salary can be arranged to meet qualifications. Apply to File No. 1187-V.

ELECTRICAL

ELECTRICAL ENGINEERS with at least five years practical experience in layout and erection high tension and low tension overhead lines on wood poles. Experience in transformer maintenance and repair, sub station switchgear maintenance and erection, would be an advantage. Required by Bahamas Government Electric Department, Nassau. Salary open. Apply to File No. 1180-V.

ELECTRONIC ENGINEERS, 23 to 35 years of age, required for design and development of radar type electronic equipment and mechanical design. Previous experience on similar type of work desirable. Location Nova Scotia. Salary $3,000 to $5,000 depending on qualifications. Apply to File No. 1189-V.

ELECTRICAL ENGINEER experienced in power systems distribution, electrical and lighting layouts for small industrial plants using up to 300 K.W. of power. Location Montreal, salary up to $350.00 per month depending upon qualifications and experience. Apply to File No. 1191-V.

MECHANICAL

MECHANICAL ENGINEERS with at least five years practical experience in the operation and maintenance of four cycle diesel alternators in sizes up to 2,500 H.P. Required by Bahamas Government, Electrical Department, Nassau, Salary open. Apply to File No. 1180-V.

MECHANICAL ENGINEER required for design, estimating and sales of various mechanical equipment, such as, internal combustion engine-driven generator sets, water purification and pumping plants industrial and contractor equipment. Position located in Ontario. Salary open. Apply to File No. 1192-V.

MECHANICAL ENGINEER, experienced in product design and production methods, must be familiar with all engineering problems relative to manufacturing of metal products. Age 35-45 for manufacturing plant located near Montreal. Salary open. Apply to File No. 1198-V.

MISCELLANEOUS

ASSISTANT TO SALES DEVELOPMENT MANAGER required for large Montreal Engineering concern for work on booklets, advertisements, editorial articles, etc., engineering background essential. Experience in writing or publicity is desirable. Salary open. Apply to File No. 1178-V.

MUNICIPAL ENGINEER required by Town of Fort Erie, Ontario. Reply giving full particulars as to age, education, qualifications, experience and remuneration. Apply to File No. 1179-V.

ASSISTANT ENGINEER for Provincial Government—West Coast. Duties include taking charge of maintenance and construction work on forest or park road projects, designing simple bridges and other structures, making reports and recommendation on allied engineering problems in connection with Forest Service projects. Must have several years practical experience. Salary $3,504 rising to $4,104 per annum. Apply to File No. 1181-V.

GRADUATE ENGINEER with technical and practical experience in concrete field required by large transit mixed concrete business in Montreal. Work would be under supervision of consulting engineer and applicant would be required to work as a liason officer between company to its consumers. Salary open. Apply to File No. 1182-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges, required by a steel company in Southern Ontario. Salary open. Apply to File No. 1184-V.

TOWN ENGINEER required for town in the Maritimes. Duties include all work connected with streets, water supply and distribution, building inspecting, etc. Salary open. Apply to File No. 1193-V.

CIVIL OR AGRICULTURAL ENGINEER required in Farm Structures Division of an agricultural college in Ontario. Applicant would be in charge of teaching to the degree students in the fourth year course also two year Associate Farm course as well as research and demonstrations related to this field of work. Salary open. Apply to File No. 1195-V.

SALES ENGINEER with knowledge of chemistry desirable wanted by Canadian branch of American firm for industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate engineer and Canadian citizen. Location Ont. Age between 30 and 40. Salary open. Apply to File No. 1196-V.

JUNIOR SALES ENGINEER wanted by Canadian branch of American firm for industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate engineer and Canadian citizen. Salary open. Location Ontario. Apply to File No. 1197-V.

CONSTRUCTION SUPERINTENDENT, capable of supervising housing project. Must be familiar with all phases of prefabrication. State previous experience. Salary open. Apply to File No. 1199-V.

CONSTRUCTION ENGINEER, for Housing Development. Must be experienced at layout and have knowledge of prefabrication. Salary open. Apply to File No. 1199-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CIVIL

CIVIL ENGINEER with at least 2 years practical experience required by a large inter-municipal Corporation in Western Canada. Under supervision and direction applicant must be able to assist and perform technical engineering work, prepare plans, perform field duties in connection with the construction and maintenance of simple structures to install equipment, supervise and direct small groups of men. Salary $235 up. Apply to File 1144-V.

GRADUATE CIVIL ENGINEER with some experience in structural steel required by firm engaged in the manufacture and sale of prefabricated steel structures. One man needed for liason and co-ordinating the work between fabricators and design engineers and one for visiting clients in Quebec, with headquarters in Toronto. Salary depends on ability and experience with a minimum of $350.00. Apply to File 1168-V.

ELECTRICAL

GRADUATE COMMUNICATION ENGINEERS, Canadian citizens, interested in audio, radio and video frequency systems engineering. Salaries up to $350 per month depending on qualifications, location Montreal. Apply to File No. 1147-V.

MECHANICAL

MECHANICAL ENGINEERS with 3 - 5 years experience in mechanical design and general plant engineering, as well as field work required by firm in Quebec. Salary open. Apply to File No. 1001-V.

GRADUATE ENGINEER, preferably with mechanical background and sales experience required by large well known firm as Representative for a Distributor of pneumatic material-handling equipment. Principal contacts will be in cement, heavy chemical, food, pulp and paper, brewing and aluminum industries. Salary open. Apply to File No. 1158-V.

MECHANICAL ENGINEER required to take over complete operation of machine shop, foundry and pattern shop in Province of Quebec. Must be bilingual. Salary open. Apply to File No. 1169-V.

SENIOR MECHANICAL DRAUGHTSMAN, thoroughly experienced in machine design with some background and knowledge of material handling equipment. Salary open. Apply to File No. 1171-V.

MECHANICAL SALES ENGINEER, age 30 to 40 years with executive ability required by old-established firm in Montreal. Good opportunity for an aggressive salesman to expand the present contacts and to create new fields. Knowledge of French an asset. Salary open. Apply to File No. 1176-V.

MINING

MINING ENGINEERS for design and layout work also some field work required by firm in Province of Quebec. Salary open. Apply to File No. 1001-V.

MISCELLANEOUS

MANAGER OF MANUFACTURING required by Canadian mill producing 500 tons per day of specialty papers, tissues, paperboard and newsprint. Position requires proven managerial ability and technical qualifications for the production of paper. Location most desirable and salary attractive. Apply to File No. 1140-V.

DESIGNING AND STRUCTURAL ENGINEERS required by Provincial Government, West Coast. Duties include designing and preparation of plans of bridges, ferries, wharf structures, etc.. in timber, steel or concrete. Preferably with experience in bridge design and construction. Salary $3,504 rising to $4,104 per annum. Apply to File No. 1142-V.

CIVIL OR SANITARY ENGINEER, with a number of years experience required by a large inter-municipal Corporation in Western Canada. Must be able to assume responsibility in design, detailing, estimating, preparing specifications, to layout and supervise the construction repairs and maintenance of a sewerage collection system and treatment plant. Salary $325 per month up. Apply to File No. 1144-V.

SUPERINTENDING ENGINEER for Eastern University to take charge of physical plant maintenance and help plan the building program. Salary from $350. Apply to File No. 1145-V.

TOWN ENGINEER required by town in Ontario. Duties include supervision of Board of Works as well as complete charge of municipal, electrical, water and telephone department projects. Salary open. Apply to File No. 1150-V.

CHIEF ENGINEER required by large public utility system in Eastern Ontario. Applicants must have had experience in the operation and design of eletcric or waterworks systems. Salary open. Apply to File No. 1151-V.

DRAUGHTSMEN, required by G.E.C. Switchgear Department, Engineering Works, Witton, Birmingham, 6, England. Must have good experience in any class of switchgear design or layout. Permanancy and good opportunities for capable men. Apply stating age, experience, and technical qualifications to File No. 1157-V.

AERODYNAMICIST capable of carrying out performance and stability calculations for initial design. Permanent position with good prospects, in Montreal area. Salary open. Apply to File No. 1159-V.

PROFESSOR AND CHAIRMAN of the Dept. of Electrical Engineering required by University of Manitoba. Position becomes vacant September 1st, 1949. Salary depends on candidate's qualifications. Apply to File No. 1162-V.

CHIEF DESIGN ENGINEER, capable of taking care of and being responsible for all drawing office work in a modern West Coast pulp and paper mill. Applicant must have a minimum of five years responsible design practice in pulp and paper work. Salary open. Apply to File No. 1164-V.

SALES ENGINEER, mechanical background required in Montreal. Must have knowledge of heating, ventilating and pumps. Salary open. Apply to File No. 1165-V.

GRADUATE ENGINEER preferably electrical or mechanical background required by large industrial plant as maintenance engineer. Duties include responsibilities of all maintenance work, also setting up and maintaining lubrication and inspection schedules. Salary open. Apply to File No. 1167-V.

SALES ENGINEER required for the Montreal district to represent a reputable conveyor company manufacturing in the Province of Ontario. Conveyor experience is desirable but not strictly necessary but engineering background essential. Remuneration would be on a commission basis with excellent possibilities. Apply to File No. 1172-V.

TWO experienced bilingual men required for approximately 18 months work in French Morocco under excellent conditions. One with structural design, field and instrument experience and one with adequate practical experience and capacity for Construction foreman opening. Salaries $350 to $550 per month. Apply to File No. 1175-V.

Situations Wanted

CIVIL ENGINEER, M.E.I.C., P.Eng., age 43, desires spare time work. Twenty-one years experience in construction, both field and office, also plant maintenance covering design, supervision and surveying. Would like design on draughting work in evenings with surveying on week-ends. Apply to File No. 225-W.

MECHANICAL AND ELECTRICAL, M.E.I.C., P.Eng. (Ont.). Age 41. Single. Overseas 1940 with R.C.E., followed by 7 years as Technical Staff Officer, British Army, on Research and Development, including period as Head of Technical Intelligence Mission to Austria. Vickers Plant Course followed by 13 years Canadian experience including Telephone Plant; Automobile; Electrical Power Apparatus and Wire and Cable; Design and Manufacture Electric Cranes, Foundry Equipment, Diesel Engines and other Heavy Engineering Products. Intimate knowledge British Ministry of Supply and Engineering Industry. Pre- and Post-War knowledge of all Europe, particularly Belgium, Switzerland, Austria and Czecho-Slovakia. Interested in European position for Canadian or U.S. firm or Administrative Engineering Post in Canada. Apply to File No. 415-W.

MECHANICAL ENGINEER, age 39, experienced in tool design and production methods, material selection, production records, control and co-ordination. Desires employment preferably in Montreal with either manufacturer or firm of Engineers who could utilize all or a part of above experience. Apply to File No. 551-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Sc. (E.E.) Manitoba, 1943. Age 27. Married. Electrical experience with R.C. Signals and 2½ years general electrical experience in industry. Sales training. Presently employed but desires position offering wider scope and opportunity. Preferably Montreal area. Apply to File No. 925-W.

PRODUCTION ENGINEER, M.E.I.C., P.Eng., McGill '33 (Electrical). Married. Extensive knowledge business organization and management. Accustomed to conferring with top Executives. Broad experience includes sales, plant organization and management, interpretation and use financial reports and plant operating statements, budgetary control, production plannings, cost development and control, method improvements, plant layout and general engineering. Desires permanent association, offering good future possibilites, with well established manufacturing or sales organization. Available on reasonable notice. Apply to File No. 1186-W.

MINING GRADUATE, M.E.I.C., with 20 years experience in mine operation and development, and associated construction etc., desires permanent connection with senior responsibility; Ontario location preferred. Apply to File No. 1252-W.

CIVIL ENGINEER, M.E.I.C., age 41, interested in position as Project Manager or Chief Engineer. Sixteen years of experience in field and office covering design and construction of large building projects, surveys, bridges, roads, dams, and particularly Hydro Electric power projects. Capable of taking complete charge of design and construction. Apply to File No. 1751-W.

CHEMICAL ENGINEERING GRADUATE M.E.I.C., McGill, 1938, age 35. My experience has included Laboratory work, production, chemical plant operation and costing, industrial development surveys, raw material supply planning, purchasing materials for plant construction and operating. Apply to File No. 1947-W.

INDUSTRIAL AND CIVIL ENGINEER, M.E.I.C., P.Eng., Que. B.A.Sc. Age 40, married. Fluently bilingual. Seeks position as Industrial Engineer, Executive Sales Engineer, Town Engineer, experience in motion and time study, methods, process, development, production control, costing, plant maintenance, highway engineering, municipal engineering, sales. Available on short notice. Apply to File No. 2157-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., University of Sask., 1940, age 32, married. Continuous employment in engineering field since graduation. Experience includes design office and field work on construction, structural and mechanical plant engineering, maintenance and project engineering, production control, cost estimating and control. Seeking responsible position with future, preferably in Montreal area (home). Available shortly. Apply to File No. 2219-W.

GRADUATE ENGINEER, M.E.I.C., McGill Chemical engineering 1935. Six years experience in plant operation, four years in the R.C.A.F., aeronautical engineering and four years in business and industrial consulting. Desire responsible position in Quebec or Ontario. Apply to File No. 2228-W.

MECHANICAL INDUSTRIAL ENGINEER, Jr.E.I.C., leaving for Europe in near future. Will undertake missions of technical or other nature. Research, executive, service or sales works. Bilingual, age 27, good appearance, broad experience. Apply to File No. 2338-W.

CIVIL ENGINEER, M.E.I.C., "33" D.L.S., railway, mining, government and construction experience. Not adverse to some travelling. Opportunity to advance lacking in present position. Married. Age 37. Available one month's notice Full details of qualifications on application. Apply to File No. 2460-W.

CIVIL ENGINEER, M.E.I.C., Prof. Eng. (Ont.) Queen's B.Sc. Mechanical background. 3 years general plant and machine shop experience. 6 months railway maintenance. 8 months railway and general construction. 8 months R.C.E. 17 months design engineer of pulp and paper mill also in charge of construction and plant layout. Presently employed as assistant chief engineer in Woodlands Division of eastern pulp and paper mill with full responsibility of all roads, bridge and building construc-

TRANSPORTATION CONSULTANT

Professional engineer for large corporation to advise on rail and water freight transportation problems.

Five to ten years responsible experience in this field and knowledge of economics required.

Apply to File No. 3882-V.

tion. Available 1 month's notice. Location immaterial. Apply to File No 2553-W.

INDUSTRIAL-MECHANICAL ENGINEER, Jr.E.I.C., P.Eng. Ont., B.A.Sc. Married. Age 29. Desires position requiring more responsibility and initiative in paper, lumber or allied industry or consulting industrial firm preferably on west coast or southern Ontario. Officer veteran. Experience in production control, cost analyses, plant and production layouts work simplification, materials handling, motion and time study, incentive systems. Now completing Business Methods course. Apply to File No. 2794-W.

CHEMICAL - METALLURGICAL ENGINEER, M.E.I.C., McGill. Age 43. Eighteen years experience in process development and operation, covering ore beneficiation (metallic and non-metallic), ferrous metallurgy, inorganic chemical processing. Positions held largely management. Familiar with determining suitable plant location and layout, equipment design and specification, process simplification, control and operation. Desires connection with progressive firm as manager of promising venture. Presently engaged. Minimum salary $6,000. Apply to File No. 2831-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Jr.E.I.C., McGill, '44. 7 years industrial experience. Welding application and metallurgy, production supervision, production specifications, purchasing, wage incentives, time study, estimating, costing, design. Available 4 weeks notice. Apply to File No. 2920-W.

RESEARCH PROBLEM WANTED: Three students working for degree of Master of Chemical Engineering who will be working in Montreal this summer on experimental portions of their thesis desire an additional problem in Applied Unit Operations to be completed on a co-operative basis to help finance studies. Apply to File No. 3049-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng., Q., G.I., Mechanical E., A.M.I. Loco., E., (Great Britain). Aged 30. married. 6 years locomotive design and construction, machine shop production and assembly. 5½ years Engineer Officer, Royal Air Force, rank Squadron Leader, Chief Technical Officer. Employed 2 years in Province of Quebec. Desires change to position with more responsibility and opportunity for advancement. Preferably Southern Ontario and Western Canada. Apply to File No. 3059-W.

GRADUATE ENGINEER, M.E.I.C., P.Eng., B.A.Sc., Toronto, married, age 31. Desires employment as assistant to construction or municipal engineer or would consider position on engineering staff of manufacturing company. 4 years army engineer officer, 4½ years experience in construction, surveying, layout and mining. Presently located in Toronto. Apply to File No. 3077-W.

SALES ENGINEER, M.E.I.C., retired Naval Officer, mechanical and electrical background. Experienced in sales and running branch office. Four years with wartime shipbuilding, 2 years with War Assets Corporation in technical and executive capacity. At present in marine and engineering supply sales. Interested in permanent position in Montreal area. Apply to File No. 3081-W.

MECHANICAL ENGINEER, Jr.E.I.C., Jr. A.S.M.E., P.Eng. (Ont.), B.Sc., Queens, '47, married. At present completing work at Yale University towards master of engineering degree. Broad basic experience. Desires appropriate position, preferably in design. Available in June. Apply to File No. 3111-W.

MECHANICAL ENGINEER, Jr.E.I.C. (B.Eng., McGill, '47), one year experience in design and draughting and some construction work. Presently completing professional course in Industrial Relations. Interested in becoming established with industrial firm to do time study work, job evaluation, wage incentive plans, personnel supervision, etc., where background of engineering could be useful. Some knowledge of French. Area of Ontario, Quebec or B.C. Available on month's notice. Apply to File No. 3149-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc (E.E.), U.B.C., 49, married. age 33 Electrical experience with R.C. Signals (overseas 6 yrs.). Desires employment in power or electronics. Available 1 May. 1949. Apply to File No. 3154-W.

ELECTRICAL ENGINEER, M.E.I.C., I.E.G. Prof. Eng., Quebec. Age 35. Several languages spoken fluently. Married. No children. Extensive practical experience in plant maintenance and trouble shooting, seeks resident position with industrial firm, available at short notice. No objection to go to country. Apply to File No. 3155-W.

ELECTRICAL ENGINEER, S.E.I.C., recent graduate of Nova Scotia Technical College, married, five summers' pre-graduation experience plant electrical maintenance, desires employment in Montreal area, preferably in design, testing or small-scale production of electronic or communications equipment. Apply to File No. 3156-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C., Canadian, 29 years of age, married, one child. Seven years varied experience mostly with one employer, in general machine-shop, foundry, drafting, process and mining industries. At present assistant mechanical superintendent of mining concern in South America. Returning to Canada in June Desire position, preferably in Canada or the U.S.A. Apply to File No. 3157-W.

ELECTRICAL ENGINEER, S.E.I.C. S.A.I.E.E., age 23, married, B.Sc. '48 from University of New Brunswick, at present taking one year post graduate work at the University of London on Beaverbrook Overseas Scholarship Summer vacations spent in the Power and Paper Industry. Returning to Canada early in September. Apply to File No. 3161-W.

GRADUATE ENGINEER, M.E.I.C., with broad administrative experience in manufacturing. Responsibilities have included development of national sales organization, planning of national advertising campaign, purchasing for light metal manufacturing plant, product promotion and development, patents and cost accounting. Youthful, aggressive, dependable and loyal. Widely travelled. Complete personal file available. Apply to File No. 3162-W.

GRADUATE MECHANICAL ENGINEER (McGill), M.E.I.C., P.Eng., Que., married, bilingual, five years sales experience in heavy plant and contracting equipment in Province of Quebec. Responsibilities include sales promotion, sales engineering in regards to steam and electrical equipment and pumps, supervision of installations and recommended maintenance schedules. Some experience in electrical installations, welding and surveying. Desires position of responsibility with progressive firm not necessarily in sales. No locality preference. Presently employed. Apply to File No. 3163-W.

MECHANICAL ENGINEER, M.E.I.C., McGill, 1942, age 28, presently engaged as design, sales and construction engineer with small company manufacturing and installing heavy industrial machinery, demand for which is falling off due to heavy oil production. Has had experience, R.C.E.M.E. Overseas, steel designing and detailing. Would consider any employment offering interesting problems, responsibility and future promotion. Apply to File No. 3164-W.

MECHANICAL ENGINEER, S.E.I.C., P.Eng., Ont., Toronto 48, married, family, age 35. 7 years drafting, shop experience. 1 year design engineer, in pulp and paper line and heavy industrial equipment. Interested in plant engineering or design, desires permanent position with responsibility. Apply to File No. 3180-W.

CIVIL ENGINEER STUDENT, S.E.I.C wants permanent position. Graduating May, 1949, from the University of New Brunswick. Veteran R.C.A.F., navigator, married, 3 children. Position preferences are with a consulting engineer or some company doing inspecting and supervising work on construction. Apply to File No. 3182-W.

CHEMICAL ENGINEER, S.E.I.C. (Laval '49), B.A.Sc., P.Eng. Age 23, single. Experienced in woodcutting operations, galvanizing mill, coal carbonization, recovery and refining of coal by-products. Desirous of obtaining a position with an engineering consulting firm dealing with chemical engineering problems (e.g. chemical plants, installation of heating systems, air conditioning, etc.) Would also consider engineering work with a well established company, preferably in the province of Quebec. Available June the 1st, 1949. Apply to File No. 3183-W.

RECENT GRADUATE, S.E.I.C., single, age 24, veteran. Now completing post-graduate study in Mechanical Engineering at Princeton University. Objective of this post-graduate work has been to develop as thorough a background as possible for manufacturing and industrial administration. At present working on thesis in quality control. Interested in any type of opening that will be available in June. Apply to File No. 3186-W.

STUDENT, S.E.I.C., in 4th year Mechanical Engineering, U. of S., graduating this spring, desires a position with the Petroleum Industry. Experience includes survey work, petroleum sales, drilling and testing oil wells, and radar technician with the R.C.A.F. In excellent health, 26 years of age, married. Apply to File No. 3187-W.

MECHANICAL AND ELECTRICAL ENGINEER, M.Sc., A.M.I.E.E., married, age 30. Also holds honours degree in physics and has good knowledge of mathematics. Desires position where these qualifications would be of value, probably in development, design or research and preferably in the field of mechanical engineering. Experience includes five years in the technical branch of the R.A.F. and eighteen months as mechanical engineer in large industrial concern. Apply to File No. 3188-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C., graduating this spring from U.N.B. Veteran, age 27, married, 2 children. 4 years with R.C.A.F. signals radar, summer, 1948, with National Research Council in microwave laboratory. Entering McGill, September, 1949, for post graduate work in communications. Desires position in or near Montreal for summer. Good references available. Apply to File No. 3190-W.

GRADUATE U.N.B., 1949, in Electrical Engineering, anxious to secure a position in Ontario or Eastern Canada. Three years experience as a wireless electrical mechanic in the R.C.A.F. and one summer as an installer of dial phone equipment, also one summer with a power and paper company. Have also a complete commercial diploma. Position desired preferably with a power company or an auxiliary of such. Apply to File No. 3196-W.

CHEMICAL ENGINEER, S.E.I.C., B.Sc., '44, M.Sc., '45, Queen's, Ph.D. from Cornell University, Ithaca, N.Y., expected this summer, desires position in research or development in the chemical industry. Age 27, married. Good background in physical and inorganic chemistry, 1½ years experience in research and development department of abrasive company working on process and product improvement. Available September 1st. Apply to File No. 3197-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Ontario, University of Manitoba '41. 32 years of age, single. Experience in construction airport buildings and sewer and water, 1½ years in aircraft inspection and instructor of inspectors, surveying for water sites, 2 years in design of reinforced concrete and steel structures. Desire position with consulting engineer, in industry, or in municipal field. Available on short notice. Apply to File No. 3198-W.

PROFESSIONAL ENGINEER, Jr.E.I.C. B.Sc. Eng. Age 34 years with 10 years engineering experience in plant operation, maintenance, design, construction and buying in the mining, rubber and petroleum refinery fields. 5 years previous diversified experience. Wishes to join the Purchasing Department of a reliable firm which is considering the employment of engineers in that department. Apply to File No. 3199-W.

MECHANICAL GRADUATE, age 24. Jr.E.I.C., P.Eng. Q., Queen's 1947. Two years experience as a Maintenance Engineer with Large Montreal industrial firm. Engaged in general plant and machinery maintenance work, including co-ordination of the work of draftsmen, machinists and other trades. Evening student in Commerce Courses. Navy veteran. Desires same type of work with another large or small Montreal industrial firm. Apply to File No. 3208-W.

GRADUATE ELECTRICAL ENGINEER, S.E.I.C., U.N.B. '49, age 22. Single. Experience limited to three summers in both peliminary and construction surveys for Highways, and one with Canal

Service. Interested in Power Installation and development. Would consider employment abroad. Apply to File No. 3209-W.

MECHANICAL GRADUATE, Grad. I.M.E., Cambridge University, single, age 26. 3 years shop apprentice in English plants, 3 years Engineer Office Royal Navy, running and maintenance of steam turbine and reciprocating machinery. Now special apprentice machinist in U.S. Desires junior production position in Ontario. Apply to File No. 3210-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., Toronto. Veteran, age 27. Primarily interested in structural steel or reinforced concrete design but will consider anything. Available immediately. Apply to File No. 3211-W.

Partner Wanted

ACTIVE PARTNERSHIP desired with a firm of General Building Contractors located in Montreal or would be interested in forming new company with one or more construction engineers. Advertiser has capital and 20 years of construction experience. For additional information, apply in confidence to File No. 2138-W.

PARTNER, wanted by engineer with 25 years experience, contemplating private practice. Must have necessary qualifications; previous experience with consulting engineer desirable. Apply to File No. 2642-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., age 33, 11 years engineering experience in mining, all types surveying, airport and highway construction, building construction, sewage and water works office administration and mechanical experience in pulp and paper industry for past 3 years. Would like to contact parties or company interested in consulting engineering or construction with view to partnership, junior or otherwise. Wanted location in west, preferably Edmonton. Apply to File No. 2792-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE
PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

Important Notice

In the past, Council has availed itself of its authority under the by-laws to extend the time for payment of fees and for application of the penalties for arrears of fees. In recent years, however, the costs of supplying the Institute's services have increased, as every member will appreciate, to an extent that Council cannot now justify the provision of these services to members who have not paid their annual fees within the period prescribed by the by-laws. Therefore:—

Effective July 1st, 1949, in accordance with the provisions of Section 25 of the by-laws, the names of members in arrears will be removed from the mailing list to be replaced when such arrears have been paid in full.

Copies of the *Journal* for July and succeeding months cannot be ordered from the printer for members in arrears. Extra copies are sometimes available and will be sent to members who pay arrears of fees as long as the supply lasts.

Library Notes

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

THEORY OF LIMIT DESIGN

J. A. Van Den Broek, M.E.I.C.

N.Y., John Wiley & Sons; London, Chapman & Hall, 1948. 144 pp., illus., diagrs., charts, tables, 8½ in., cloth, $3.50.

Reviewed by P. L. Pratley, M.E.I.C.*

Theory of Limit Design covers numerous articles on the same subject published previously, much laboratory investigation on slender columns, and certain material new to the present reviewer in the way of column formulae.

The built-in and continuous beams are treated much as usual, but rather more discussion is accorded to the problem of the transmission towers.

While the subject is theoretically interesting, its practical application is definitely limited and in some respects can be questioned, particularly as to wisdom. The actual effect of using this theory on beam design is simply to increase the permissible loading by allowing higher unit stresses, all of which will occur in practice within the elastic zone before plastic yield begins. By proportioning a uniformly loaded single span built-in beam for a moment of

$$\frac{wL^2}{16} \text{ instead of } \frac{wL^2}{12}$$

the apparent capacity load is raised by one-third, while the ultimate fibre stress remains at the specified elastic limit, say 35,000 lbs. for medium steel. Due, however, to the adoption of a factor of safety of say two, the permitted working load never induces plastic yield and the system remains elastic: the governing moment is $\frac{1}{2}$ of $\frac{wL^2}{12}$ and the working fibre stress reaches $\frac{2}{3}$ of 35,000 lbs. or 23,333 lbs. instead of the 20,000 lbs. normally specified. In other words, cutting the capacity load by two does not cut the ultimate fibre stress by two, from 35,000 to 17,500, because the distribution of moment assumed in arriving at a fibre stress of 35,000 under capacity load does not occur, so that the factor of two is illusory if applied to fibre stresses.

The author states quite frankly on Page 122 and makes a clear reference to the same fact on Page 89, that the crux of his method when applied to redundant frameworks such as transmission towers, is the assumption that once "the buckling strength of the compression diagonal is reached, its carrying power remains constant until some other member, say the tension diagonal or the cross strut CD, is also loaded to its capacity strength." This is difficult to accept as a fact in spite of the succeeding paragraph, for it must again be realized that when the safety factor of approximately two is applied to the external load, making this figure half the capacity load, a situation is created which ensures that this crux is not proven because plastic yield is not experienced.

The theory is interesting as a theory, but dangerous to offer as a design method, because only the experienced and thoughtful designer will remember that the stress distribution assumed in computing capacity loads is rendered impossible when a factor of safety of two is applied.

The reading of the book suggests, as did the reading of all previous articles by the same author on the same subject, that this tool, useful though it might be in certain circumstances, should not be placed unreservedly in the hands of the inexperienced designer. It should be reserved for the occasional use of the competent and experienced engineer possessed of a full appreciation of the assumptions adopted and of the departure from the elastic theory and also possessed of considerable independent practical judgment.

The present reviewer continues to protest against the claim made on Page 82 that eccentricity, end moments, and a length ratio are identical. They are interrelated unquestionably, but being respectively of dimensions —, length —, mass x length —, and 0, they cannot, by any stretch of the facile imagination, be regarded as identical. To persist in such a claim only adds confusion to confusion and indeed, while the author knows very well what he is talking about, he seems to take extraordinary steps to give the impression that he doesn't.

Minor confusion is introduced by the different form of equation w on pages 101 and 111 and equation x on pages 106 and 111, while on page 97 the word in the middle of line 14 is "almost" not "most".

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SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC

Airplane Structural Analysis and Design:
E. E. Sechler and L. G. Dunn. New York, Wiley; London, Chapman and Hall, 1942. 420 pp., illus., cloth. (Galcit Aeronautical Series.)

Bibliographic Survey of Corrosion, 1945; a Compilation of Corrosion Abstracts:
Illinois Institute of Technology, Corrosion Research Laboratory. Houston, Texas; National Association of Corrosion Engineers, 1948. 129 pp., cloth.

Bibliography of Cement and Concrete, 2d ed.:
Cement and Concrete Association, London, 1949. 46 pp., paper.

Cheaper by the Dozen:
F. B. Gilbreth, Jr., and E. G. Carey. New York, Crowell, 1948. 237 pp., illus., cloth.

Cosmic Ray Physics:
D. J. X. Montgomery. Princeton, N.J.; Princeton University Press, 1949. 370 pp., illus., cloth.

Cylinder Wear in Diesel Engines with, a Special View to Large Marine Units:
Carl Hoegh. Brooklyn, N.Y.; Chemical Publishing Co., 1949. 238 pp., illus., cloth.

Elements of Applied Hydrology:
Don Johnstone and W. P. Cross. New York, Ronald Press, 1949. 276 pp., illus., cloth.

Engineering the New Age:
J. J. O'Neill. New York, Ives Washburn, 1949. 320 pp., cloth.

Foundations of Nuclear Physics; Facsimiles of Thirteen Fundamental Studies as they were originally reported in the Scientific Journals, with a Bibliography:
Dover Publications, New York, 1949. 273 pp., illus., cloth.

LIBRARY REGULATIONS

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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

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Non-members may consult the library, but may not borrow material.

Heating, Ventilating, Air Conditioning Guide, Volume 27, 1949:

American Society of Heating and Ventilating Engineers, 1949. 1,384 pp., illus., fabrikoid.

Instrument Manual, 1949:

United Trade Press, London, 1949. 660 pp., illus., cloth.

Invention and Innovation in the Radio Industry:

W. R. Maclaurin and R. J. Harman, with a Foreword by K. T. Compton. New York, Toronto; Macmillan, 1949. 304 pp., illus., cloth. (Massachusetts Institute of Technology Studies of Innovation.)

Metallurgical Study of German Aircraft Engine and Airframe Parts, Part 2:

Special and Alloy Steel Committee. London, Manchester; Kennedy Press, 1948. 110 pp., illus., cloth.

National Conference on Industrial Hydraulics, Fourth Meeting, October 20-21, 1948, Proceedings, Volume 2:

Armour Research Foundation of Illinois Institute of Technology, Chicago, 1949. 154 pp., illus., paper.

Numerical Calculus; Approximations, Interpolation, Finite Differences, Numerical Integration, and Curve Fitting:

W. E. Milne. Princeton, N.J.; Princeton University Press, 1949. 393 pp., illus., cloth.

On the Theory of Stochastic Processes and their Application to the Theory of Cosmic Radiation:

Niels Arley. New York, Wiley, 1948. 240 pp., illus., cloth.

Personnel Selection; Test and Measurement Techniques:

R. L. Thorndike. New York, Wiley; London, Chapman and Hall, 1949. 358 pp., illus., cloth.

Photoelectricity and its Application:

V. K. Zworykin and E. G. Ramberg. New York, Wiley; London, Chapman and Hall, 1949. 494 pp., illus., cloth.

Radioactive Measurements with Nuclear Emulsions:

Herman Yagoda. New York, Wiley; London, Chapman and Hall, 1949. 356 pp., illus., cloth.

Royal Society Empire Scientific Conference, June-July, 1946, Report:

Royal Society, London, 1948. 2 vols., illus., cloth.

Theory of Modern Steel Structures, Volume 2—Statically Indeterminate Structures and Space Frames, rev. ed.:

L. E. Grinter. New York, Macmillan, 1949. 312 pp., illus., cloth.

Three Decades; the Story of the State Electricity Commission of Victoria from its Inception to December 1948:

Hutchinson & Co. (Publishers) Ltd., Melbourne, Australia, 1949. 192 pp., illus., cloth.

War History of the Radio Branch:

National Research Council of Canada, Radio Branch, Ottawa, 1948. 131 pp., illus., paper. (N.R.C. Report No. ERA-141.)

TECHNICAL BULLETINS, ETC.

Institute of Metals. Reprints:

Application of Flux Degassing to Commercially Cast Phosphor Bronze, N.I. Bond-Williams.—Melting and Casting Aluminium Bronze Ingots for Subsequent Working, A. J. Murphy and G. T. Callis.—Melting and Casting of Brass, Maurice Cook and N. F. Fletcher.—Melting and Casting of Nickel Silver at the Works of Messrs. Henry Wiggin and Co., Ltd., E. J. Bradbury and P. G. Turner.—Melting and Casting of Non-Ferrous Metals, G. L. Bailey and W. A. Baker.—Production of Refined-Copper Shapes, R. H. Waddington.

Institute of the Aeronautical Sciences:

Aeronautical Engineering Catalog, 1949.

Institution of Electrical Engineers. Proofs:

Detection by Oscillographic Methods of Winding Failures during Impulse Tests on Transformers, E. C. Rippon and G. H. Hickling. — Hot-Cathode Thyratrons: Practical Studies of Characteristics, H. deB. Knight.—Motor Uniselector and the Technique of its Application in Telecommunication, W. H. Grinsted.—Parasitic Forces Existing in Induction Watt-Hour Meters, G. F. Shotter.

Institution of Mechanical Engineers. Advance Copies:

Dynamic Principles of Machine Foundations and Ground, J. H. A. Crockett.—Fatigue Strength of Cast Crankshafts, H. R. Mills and R. J. Love.—Measurement of Kinetic Boundary Friction, or the Experimental Investigation of "Oiliness", J. R. Bristow.—Seizure of Metals, F. P. Bowden and D. Tabor.—Surface Roughness of Bearing Surfaces and its Relation to Oil Film Thickness at Breakdown, A. Cameron.

International Civil Aviation Organization. Publications:

Aeronautical Agreements and Contracts (Doc 6188 LGB/12).—Air Transport Statistical Summary No. 2 (Doc 6535-AT/685). — Supplementary Procedures for the South Pacific Region, 2d ed. (Doc 6400).

Iowa State College. Engineering Experiment Station. Bulletin:

162—Some Performance Characteristics of Electrical Brushes, E. E. Jones and M. S. Coover.—163—Moisture Relations in the Manufacture and Use of Cornstalk Insulating Board, O. R. Sweeney and L. K. Arnold.—164—Determination of Factors Affecting Lamination in Structural Clay Products, A. L. Johnson.

North-East Coast Institution of Engineers and Shipbuilders. Advance Copies:

Causes and Prevention of Slamming on Ships in a Seaway, J. L. Kent.—Experiments on a Light Alloy Model Superstructure, W. Muckle.—More Diesel Varia, F. G. van Asperen.

Society of Naval Architects and Marine Engineers. Advance Copies:

No. 1—Fighting Fire at Sea, H. J. Burke.—No. 2—Reconversion of Liner S.S. "Lurline", Robert Tate.—No. 3—Automatic Steering of Ships by Proportional Control, L. I. Schiff and Marvin Gimprich.

U.S. Bureau of Mines. Bulletin:

470—Safety Practices in Dredging and Hydraulic Mining, R. W. Fatzinger.

University of Illinois. Engineering Experiment Station. Bulletin Series:

No. 378—Investigation of Creep, Fracture, and Bending of Lead and Lead Alloys for Cable Sheathing—Series 1946, C. W. Dollins.—No. 379—Non-Pressure Treatments of Round Northern White Cedar Timbers with Creosote, E. E. King.

...Circular Series:

No. 50—Bibliography of Electro-Organic Chemistry, Part I, Sherlock Swann, Jr.—No. 53—Papers Presented at the Seventh Short Course in Coal Utilization held at the University of Illinois, September 17-19, 1946.—No. 54—Papers Presented at the First Short Course on Hot Water and Steam Heating Systems, held at the Undergraduate Division, University of Illinois, Navy Pier, Chicago, September 9-11, 1947.

...Reprint Series:

No. 39—Progress Reports of Investigation of Railroad Rails and Joint Bars, R. E. Cramer and R. S. Jensen.—No. 40—Third Progress Report of the Investigation of Methods of Roadbed Stabilization, Rockwell Smith.—No. 41—Phase-Sensitive Indicating Devices, H. C. Roberts.

PAMPHLETS, ETC.

Alloy Steels; their Properties and Industrial Application:

J. Winning. Manchester, Emmott, 1948. (Mechanical World Monographs No. 49).

Engineering and Marine Exhibition, incorporating the Welding Exhibition, Aug. 25th to Sept. 10th, 1949, Olympia, London. Official Bulletin of Exhibits:

The Exhibition, London, 1949.

Film in Industrial Safety Training:

P. R. Ignatius. Boston, Mass., Harvard University, 1949.

Function of Fares:

L. K. Sillcox. New York, New York Air Brake Co., 1949.

Preliminary Report upon Administration of the Plan, Vancouver, British Columbia:

Vancouver Town Planning Commission. St. Louis, Missouri; Harland Bartholomew and Associates, 1948.

Signaling Significance:

L. K. Sillcox. New York, New York Air Brake Co., 1949.

Theoretical Study of Ram-Jet Propulsion:

Boleslaw Szczeniowski. (Reprinted from Canadian Journal of Research Section A, volume 26, number 6, November 1948.)

Transport in Time of Change:

L. K. Sillcox. New York, New York Air Brake Co., 1949.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARDS FOR THE AUTOMOBILE INDUSTRY:

British Standards Institution, London, 1948. (B.S. Handbook No. 8.) 335 pp., illus., 8¾ x 5¾ in., cloth, 15/-.

This Handbook brings together in readily accessible form the standards of direct interest to the automobile industry and all concerned with it. It contains automobile standards of the Society of Motor Manufacturers and Traders; British Standards in full, or those parts which are of direct interest to the automobile industry; horse power correction charts; S.A.E. standards for splines and serrations; steels

for the motor industry in the form of bars and forgings, sheet and strip, and wire for springs; and references to British Standards for aluminium and aluminium alloys, bronzes and brasses.

BRITISH STANDARDS INSTITUTION. STANDARDS:

British Standards Institution, London.

Compressed Natural Rock Asphalt. BS 348:1948; Mastic Asphalt (Limestone Aggregate) for Roads and Footways. BS 1447:1948; Mastic Asphalt (Natural Rock Asphalt Aggregate) for Roads and Footways. BS 1446:1948.

These three standards on asphalt are revised editions of BS 348 and BS 596. The most important change relates to chippings.

Media for Biological Percolating Filters. BS 1438:1948. 2/6.

This standard prescribes for durability, uniformity of size, shape of the pieces of medium, cleanness, nature of surface, chemical inertness, and mechanical properties of filters for treatment of sewage, water, and certain trade waste waters.

CONCISE HISTORY OF MATHEMATICS:

Dirk J. Struik. New York, Dover, 1948. 2 vols., illus., 6¾ x 4½ in., cloth, $1.50 per vol., $3.00 per set.

This is a short description of the main trends in the development of mathematics from its earliest beginnings up to 1900, and of the social and cultural setting in which it took place. Emphasis is placed on the continuity and affinity of thought in the Oriental civilizations; on the distinction between established fact, hypothesis, and tradition; on the relation of trends in Renaissance mathematics to the commerce and engineering of the time; on the persons and schools rather than subjects in nineteenth century mathematics. There are many illustrations and bibliographies are given for each section.

EDUCATION FOR PROFESSIONAL RESPONSIBILITY:

Inter-Professions Conference on Education for Professional Responsibility. Pittsburgh, Carnegie Press, 1948. 207 pp., illus., 8½ x 5½ in., fabrikoid.

The purpose of the conference was to promote the interchange of experience among teachers of medicine, law, divinity, engineering, and business. The sessions were concerned with the objectives of professional education; content and method in professional education; and the social and humanistic aspects of professional education. The papers of particular interest to engineers deal with the achievement of objectives in the education of the engineer; objectives and objectivity in science; and the use of problems and instances to make engineering education profitable.

ELECTRIC WINDERS; a Manual on the Design, Construction, Application, and Operation of Winding Engines and Mine Hoists, 2d ed.:

H. H. Broughton. London, Spon, 1948. 450 pp., illus., 9¾ x 7½ in., fabrikoid, 63/– plus 1/6– postage.

This text is based on the analysis of approximately 2,000 winders and mine hoists. A large number of tables is featured in order to make data immediately serviceable. In this new edition, there is much additional and new material, as, for instance, Koepe-pulley winders, deep-level winding, intensive hoisting, and skip-hoisting of coal. Accounts are given of a number of failures in the hope of improving design and construction. There are extensive bibliographies on every aspect of the subject treated in the book.

PARKING LOT OPERATION:

C. S. LeCraw, Jr., and W. S. Smith. Saugatuck, Conn., Eno Foundation for Highway Traffic Control, 1948. 114 pp., illus., 9 x 6 in., paper.

Includes general information on parking lots, and discussions on layout and arrangement of lots, practices and policies in lot operation, efficiency of lot use, policies on head-in and back-in parking, practices in vehicle delivery, relationships of lot capacity to waiting times, the allocation of area, and financial matters.

RADIO HANDBOOK (Manuel Radio), édition française:

Editions Techniques, anct. P. H. Brans, Antwerp, Belgium, 1948. 351 pp., illus., 11¾ x 8 in., paper.

This manual is a translation of the 10th edition of "Radio Handbook", published by Editors and Engineers, Santa Barbara, California. It deals with short wave or high-frequency radio, especially for the licensed amateur. Some of the subjects included are vacuum tubes, radio receivers, radio sets, frequency modulation, antennas, cathode ray oscillographs. There are numerous illustrations, diagrams, and tables.

THEORY AND CALCULATION OF ALTERNATING CURRENTS:

B. C. Lee. London, Spon, 1948. 150 pp., illus., 8¾ x 5½ in., cloth, 16s. plus 4d. postage.

In this book, a knowledge of direct-current circuit theory and of elementary calculus is assumed. The contents include alternating current fundamentals, series and parallel circuits, power and power factor, resonance, three-phase circuits, vector algebra, complex waveforms, equivalent circuits, network theorems, short-circuit calculations, and symmetrical components. Special emphasis is laid on circuit conventions. The author is of the opinion that a firmly based system of conventions is essential to the logical development of polyphase circuit theory. A large number of worked examples is included.

TRAFFIC DESIGN OF PARKING GARAGES:

Edmund R. Ricker. Saugatuck, Conn., Eno Foundation for Highway Traffic Control, 1948. 182 pp., illus., 9 x 6 in., paper.

This study evaluates the design features of off-street parking facilities from the viewpoint of traffic engineering, and presents factual data for those interested in building new facilities, either as owners or designers. Methods and techniques that the traffic engineer applies to traffic on the highway and street system apply directly to location, design, and operation of terminal facilities.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

BASIC ELECTRICAL ENGINEERING FOR STUDENTS OF ELECTRICAL ENGINEERING.

G. F. Corcoran. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 449 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $4.50.

This textbook was designed especially for use in an introductory course in electrical engineering. The most outstanding feature is the simple and direct method by which magnetic field concepts are handled. First D-C theory is considered, with D-C circuit analyses by the mesh and model methods. This is followed by electric field theory, magnetic field theory, inductance, capacitance, and non-linear circuit elements. There is a wide range of problems with each chapter. The rationalized m k s system of units is employed.

COMPUTATION CURVES FOR COMPRESSIBLE FLUID PROBLEMS.

C. L. Dailey and F. C. Wood. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 33 pp., text, charts, 11¼ x 9¼ in., paper, $2.00.

Serving as supplementary material to the text, "Aerodynamics of a Compressible Fluid", by Liepmann and Puckett, this volume presents a series of charts in three sections: energy relations and heat addition functions; plane shock and expansion relations; and conical flow relations—Taylor-Maccoll theory. A brief discussion is given of each function and its corresponding plot to explain its use.

DESIGN OF STEEL BUILDINGS, 3d ed.

H. D. Hauf and H. A. Pfisterer. John Wiley & Sons, New York; Chapman & Hall, Limited, London, 1949. 280 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $5.00.

This book presents the general principles of structural design as applied to the framing of commercial, institutional and residential type buildings. In this edition the material on welded construction has been expanded. In addition to a general discussion of welded framing connections, the application of welding to the design of plate girders and roof trusses is treated in detail. The chapter on the design of beams has been rewritten, and a more detailed treatment of the use of safe loading tables included. All the problems have been revised and new ones added.

EARTH CONDUCTION EFFECTS IN TRANSMISSION SYSTEMS.

E. D. Sunde. D. Van Nostrand Co., New York, Toronto, London, 1949. 373 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50 in Canada.

Primarily concerned with fundamental methods, this book deals with the analysis of earth conduction effects and the principles underlying protective measures against resultant circuit disturbances. Theory is presented from first principles, together with formulas, curves, and methods used in engineering applications. The MKS system of units is used. Each aspect of earth conduction is presented with a coverage of present knowledge and new material gained from studies made at the Bell Telephone Laboratories. There is a bibliography.

ELECTROMECHANICAL TRANSDUCERS AND WAVE FILTERS. 2d ed.

W. P. Mason. D. Van Nostrand Co., Toronto, New York and London, 1948. 419 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50 in Canada.

This book presents the fundamental analogies and interconnections between electrical and mechanical theory. The present edition incorporates a number of new topics, some of them growing out of work on transducers and filters during the war. The subjects selected have been those which round out and apply the methods already described in the book which cover electrical network theory, acoustic equations, vibration of membranes and plates, and various electromechanical systems.

ELEMENTS OF MECHANICAL VIBRATION, 2d ed.

C. R. Freberg and E. N. Kemler. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 227 pp., illus., diagrs., charts, tables, $9\frac{1}{4}$ x 6 in., cloth, $3.75.

Of interest to both students and engineers, this book is a practical, elementary treatment of mechanical vibration, including the mobility method, and the electrical analogue. As in the previous edition, all problems are treated simply from a basic analysis. Two new chapters include material on sound and its engineering applications and on beams.

EXAMINATION AND VALUATION OF MINERAL PROPERTY, 3d ed.

R. D. Parks. Addison-Wesley Press, Cambridge 42, Mass., 1949. 504 pp., illus., diagrs., charts, tables, $7\frac{1}{4}$ x $4\frac{1}{2}$ in., fabrikoid, $5.00.

This book presents a clear discussion of the procedure of the examination, the collection of data, and the calculation of the valuation of mining property, with applications helpful in commercial valuations. This edition is thoroughly revised and expanded to cover evaluation of oil property, treatment and marketing of complex lead-zinc ores, standard sampling practices, and the geological field investigation.

INDUSTRIAL ELECTRICITY, VOL. 2 —ALTERNATING-CURRENT PRACTICE.

W. H. Timbie and the late F. G. Willson. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 781 pp., illus., diagrs., charts, tables, $8\frac{1}{2}$ x $5\frac{1}{2}$ in., cloth, $5.96.

This book provides the reader with a thorough knowledge of the fundamentals of alternating current in practice and in theory. Following the application of a particular principle, the principle itself is explained. After theory come examples which take up other applications, followed by problems to be worked out. A knowledge of simple algebra, arithmetic, and direct current principles is assumed. Some 500 diagrams and illustrations are included. Volume I of the set covered direct current in a similar manner.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, NACA—UNIVERSITY CONFERENCE ON AERODYNAMICS.

Papers, Langley Aeronautical Laboratory, Langley Field, Va., June 21-23, 1948. Durand Reprinting Committee, California Institute of Technology, Pasadena, Calif. 411 pp., illus., diagrs., charts, tables, 11 x $8\frac{1}{2}$ in., stiff paper, $3.00.

This publication contains reproductions of some twenty technical papers presented at the NACA—University Conference on Aerodynamics held at the Langley Aeronautical Laboratory in June 1948. The papers review the status of a number of fields of interest, summarize the more important wartime advances that are no longer classified, and orient reference material for further study. Supersonics, stability and control, and wing characteristics comprise the main groups considered.

PRACTICAL ANALYSIS, GRAPHICAL AND NUMERICAL METHODS.

Fr. A. Willers, translated by R. T. Beyer. Dover Publications, New York, 1948. 422 pp., diagrs., charts, tables, $9\frac{1}{2}$ x 6 in., cloth, $6.00.

This comprehensive work presents the numerical and graphical and many of the instrumental methods of analysis which provide solutions useful to the practical scientist. The first chapter deals with the special problems encountered in calculating with approximate numbers. The succeeding chapters cover standard methods of interpolation, methods of numerical differentiation, practical determination of the roots of single algebraic equations and systems of linear equations, empirical formulas, and the graphical and numerical integration of differential equations.

RADIO AMATEUR'S HANDBOOK, 26th Edition, 1949.

American Radio Relay League, West Hartford, Conn. 736 pp., illus., diagrs., charts, tables, $9\frac{1}{2}$ x $6\frac{1}{2}$ in., paper, $2.00.

This standard manual of amateur radio communication is revised and restyled in the light of current needs as a radio construction manual, reference work, and training text. A large assortment of new equipment has been added to the receiver and transmitter chapters, material on single-sideband telephony included, and a new section on practical filter design added. A comprehensive treatment is given of keying methods and techniques, antennas and transmission lines, and radiotelephony.

SCIENCE AND ENGINEERING OF NUCLEAR POWER, Volume II.

A. O. Allen and others, edited by C. Goodman. Addison-Wesley Press, Kendall Sq. Bldg., Cambridge 42, Mass., 1949. 317 pp., plus Index, illus., diagrs., charts, tables, $10\frac{3}{4}$ x 8 in., cloth, $7.50.

Of value to those interested in the industrial applications of nuclear energy, this volume contains 17 pages on specific aspects of the subject. Source materials, isotope separation, various aspects of pile design, applications to rockets, effects of radiation, health physics, and future developments of nuclear energy are discussed. The previous volume contained 12 papers constituting a general survey of the fundamentals of chain-reacting systems.

SEWERAGE DESIGN AND SPECIFICATION.

L. B. Escritt. Contractors Record and Municipal Engineering, Lennox House, Norfolk St., London, W.C.2, 1947. 293 pp., illus., diagrs., charts, maps, tables, $9\frac{3}{4}$ x 6 in., cloth, 30s.

Written for sewer designers, this British book explains the main principles of sewerage in a manner that should make the subject clear to the practical man. Broad outline as well as detail is discussed. Such topics are discussed as soil and surface water sewerage, land drainage, construction of sewers, man-holes and chambers, flushing and ventilation of sewers, and conditions of surcharge. A section is devoted to sewerage of coastal towns. A bibliography of 157 references, mostly to British publications, is included.

TEXTBOOK OF GEOMORPHOLOGY, 2d ed.

P. G. Worcester. 2d ed. D. Van Nostrand Co., Toronto, New York, London, 1948. 584 pp., illus., diagrs., maps, tables, $9\frac{1}{4}$ x 6 in., cloth, $5.25.

Designed for an introductory course, this book states the fundamental principles, gives precise definitions, and describes and illustrates land-forms. The second edition has improved illustrations, clarifies certain principles, corrects minor errors, rearranges some of the material, and now has lists of topographic maps. The work is particularly well-illustrated by nearly 400 effective photographs and diagrams.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Ansul Chemical Company, Marinette, Wis., has developed an all-stainless steel valve for mixing liquid or gaseous sulphur dioxide and water. This valve is being successfully used in the pulp and paper and food processing industries in the United States. Details will be supplied by the manufacturer.

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Practical subjects on finishing and plating will be featured in the symposiums and at a round table discussion during the Annual Convention of the American Electroplaters' Society, which will be held in Milwaukee, Wis., June 27th to June 30th.

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Parker-Kalon Corporation, New York City, has announced very substantial price reductions on all types of slotted head hardened self-tapping screws. This reduction brings prices back to the January 1949 level and represents a cut of about 11%.

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Charles Bruning Company, Inc., 4754 Montrose Ave., Chicago 41, Ill., have announced a new draughtsman's instrument which makes it comparatively simple to create perspective drawings. The new instrument is called the Bruning "Perspect-O-Metric". The manufacturer will be pleased to supply details.

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Announcement is made of a working arrangement between Johns-Manville Sales Corporation and H. K. Metal Craft Manufacturing Company of New York. This arrangement provides for the fabrication of Johns-Manville flexboard.

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The division of Physics of the National Research Council of Canada is doing pioneer work on a radically new design of Geiger-Mueller tube.

•

Extension of the Edmonton-Regina pipe line to the head of the lakes is anticipated in the near future by H. H. Hewetson, chairman of the board of Imperial Oil. This statement was made at a meeting of the Regina Chamber of Commerce on May 25th. Mr. Hewetson said, "In view of the magnitude of this project and the very large capital required, it is in the interest of all concerned in prairie oil developments to see that, in the interval before such a project can be carried out, the prairie oil situation is handled so the money available for the over-all development of western oil will be usefully employed." Mr. Hewetson noted that Alberta oil wells are now on restricted production because markets cannot be reached that will absorb a larger part of the potential output. Development drilling operations are bringing in new wells practically every day and, while these new wells are building up potential production, they are adding nothing to current production. Mr. Hewetson continued, "It seems in such a situation it would be more sensible to use our available capital to provide further outlets for crude in a logical market than to use the money for premature drilling. It is important that we proceed in an effective manner, both with regard to the heavy financial burdens and the equities involved, so that we can establish ourselves in a competitive position to supply eastern markets along the Great Lakes in Canada and, in due course, similar United States markets. The only way to accomplish this," said Mr. Hewetson, "Is by the construction and use of a pipe line extension from Regina to the Lakehead. The pipe line would provide a means for the producers generally to participate in available business in the new areas that would then be brought within reach." Mr. Hewetson was of the opinion that we can now look forward to the day when all Canada will be self-sufficient in oil. This is an outlook that private enterprise has made a real possibility.

•

Officials of The Consolidated Mining and Smelting Co. of Canada, Limited and the Trail District Recreational Projects Society announced, recently, that the contract for the Cominco Arena has been awarded to the Northern Construction Company of Vancouver. The building was designed by McCarter and Nairne, and it will be situated on the Victoria Park site. It will have an overall size of 277′ x 175′ with a height of 42′ above street level. The ice surface will be a standard 85′ x 200′ and the building will have a seating capacity of 2500 plus standing room for approximately 1,000 people. The structure will be of reinforced concrete with an arched roof supported by steel trusses.

•

Precision Radiation Instruments Inc., 1101 North Paulina Street, Chicago 22, Ill., has produced a new type of Geiger Counter for the use of prospectors. The Company will be pleased to supply details.

•

A new 2-way mobile radio, which promises to double available communication channels and open new facilities to police, fire departments, taxi-cab and trucking fleets, is now in production at the RCA Victor Works, Montreal. The equipment is designed to operate on the 152-174 megacycle band. This new mobile unit takes advantage of specially highly selective circuits and makes it possible to operate in channels between stations now on the air without "spill-over" into adjacent channels. The new transmitter-receiver is completely contained in a single metal-shielded unit only slightly larger than a shoe-box.

•

The Trane Company recently completed 25 years of service in Canada. A 25th anniversary banquet was held in Toronto. The president of the company, R. N. Trane, flew from California to be present. Mr. Trane stated that in 1924 the Company had five employees in Canada; to-day the total is in excess of 350. A limited line of steam specialties has grown to a complete line of heating, cooling and air handling equipment designed and manufactured by the Company here. Sales engineers in 1924 numbered two and to-day the Company maintains 14 branch offices in Canada. These are located in the principal cities from coast to coast, each staffed by engineers. Floor space, which was originally a small basement, now consists of 130,000 sq. ft. required for manufacturing, storage, office and engineering facilities. Plans are now in progress for further expansion.

Mr. Trane stated that Trane sales in Canada have continuously exceeded Trane U.S. sales on a per capita basis. This, he felt, has proved the wisdom of the Company policy of re-investment in Canada by which, during the last 25 years, the major share of net profits has been retained to expand and develop Canadian business.

•

After several months of development, Canadian General Electric Company Limited has opened its new "Lighting Institute" to teach and demonstrate the principles of good lighting. The Institute is located at 165 Dufferin Street, Toronto. The courses provided by the Institute are available to all groups interested in good lighting.

•

A new double impeller impact breaker, designed for secondary crushing and small gravel installations, is now being


YOU SEE THIS ONLY ONCE
THE all-important steel frame of a modern building is only seen during construction—yet the safety and durability of the structure depends largely on this vital steel work.
Dominion Bridge has designed, fabricated and erected the steel frames of most of Canada's largest buildings.
STEEL WORK DOMINION BRIDGE COMPANY LTD
Illustrated: The Marine Building, Vancouver. Building steel work by Dominion Bridge.
STRUCTURAL DIVISION
DOMINION BRIDGE
COMPANY LIMITED
Established 1882
PLANTS and OFFICES in PRINCIPAL CITIES OF CANADA — HEAD OFFICE: LACHINE (MONTREAL) QUEBEC

produced by the New Holland Manufacturing Company, Mountville, Pa.

•

First production in Canada of fluorescent lamps up to 95 inches in length is now under way in the Oakville Works of Canadian General Electric Company. These instant-start lamps provide longer lines of light with fewer breaks, giving unique architectural effects. This new type of lamp is already in use in the Laurentien Hotel, Montreal.

•

W. B. Connor Engineering Corp., 114 East 32nd St., New York 16, N.Y., has announced the development and immediate volume production of a new, self-contained cell-type unit for air conditioning and ventilating systems. With a capacity of 1,000 cubic feet of air per minute, this unit, known as the type " C " cell, has overall dimensions of 24″ x 24″ x 8¾″ deep, low air flow resistance, and has been designed to provide a simple, effective air purification device that can be installed and serviced with the ease and facility of a dust filter. Many other features are incorporated.

•

Colonel R. D. Harkness, president of the Northern Electric Company Limited, announced that the first electronic dictating machine to be manufactured in Canada came off the production lines, at his Company's electronic division in Belleville, a few weeks ago.

Arrangements were completed recently by which Northern Electric secured Canadian rights for the manufacture, sale and service of the "Audograph."

•

On June 1st the Honourable Colin Gibson, minister of mines and resources touched a button to start production of 67,000 tons of special steel plate at the Hamilton works of the Steel Company of Canada. This steel will be used for the projected Imperial Oil Ltd. pipe line from Edmonton eastward. The order will take 10 months to complete and it is the largest plate order Stelco has received to date.

•

The old 525-room Hotel Vancouver, Vancouver, B.C., is being demolished. Oxy-acetylene blowpipes are being used to salvage the structural steel and it is reported that the recovered steel is as good as it was when put in and that there is a complete absence of corrosion. It has also been found possible to salvage rods from the concrete.

Appointments and Transfers

Mine Safety Appliances Co. of Canada Limited have opened a new Vancouver office and warehouse at 3607 West Broadway. The telephone number is Cherry 2020. W. H. Barrington has been appointed manager. He was formerly connected with the Company's office in Toronto.

•

Watson Jack & Company are now located in " Wajax House ", 1543 Crescent Street, Montreal.

•

The B. Greening Wire Company Limited, of Hamilton, Ontario have announced that P. A. D. Hobbs & Co. Ltd. have been appointed their Western British Columbia agents. The new agents will carry, in their Vancouver warehouse, large supplies of logging, marine, mining, construction and industrial ropes of all types.

•

The Montreal office of the Hamilton Gear and Machine Company Limited is now located at 1838 Dorchester Street West. The telephone number is FItzroy 5872.

•

The Montreal office of The Toronto Iron Works Limited is now located at 1411 Crescent Street, room 307, telephone BElair 4691. C. Earle Hogarth is the district representative.

•

I. J. Haug & Sons Limited have been appointed South Saskatchewan representatives of The B. Greening Wire Co. Ltd. of Hamilton.

•

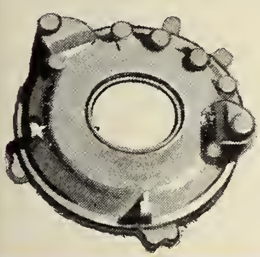
W. M. McKie has been appointed Toronto district sales representative for Canadian General Electric's heavy in-

(*Continued on page 392*)

Most Engineers are from Missouri

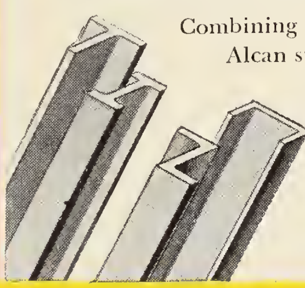
They don't take things for granted.
They have to be sure of the materials they specify.
Today more and more of them are sold on aluminum —
on its lightness, durability and fine appearance. They're specifying this bright, rustproof metal for an ever-widening variety of engineering requirements.
Shown below are four of the many Alcan aluminum products of interest to engineers:

Alcan Aluminum Castings



Clean, smooth castings with unusually fine grain and close tolerances. These rustproof, corrosion-resistant castings need no painting. They weigh approximately 50% less than similar castings made of other metals.

Alcan Aluminum Structural Shapes

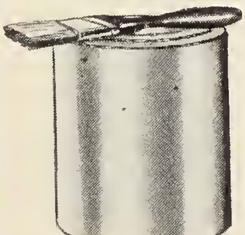


Combining high-strength with light weight Alcan structural shapes are the answer to many engineering problems. Available in a wide variety of shapes and sizes. Standard shapes are described in detail on data sheets available on request.

Aluminum Foil Insulation

Reflects 95% radiant heat. An ideal insulation for boilers and steam piping. Helically-wound aluminum foil-air heat insulation is fireproof and permanent. It will not absorb water in the event of leakage.

Aluminum Paint Made with Alpaste



Reflects 75% of light and radiant heat — reduces temperature rise in tanks and building interiors. holds heat inside boilers and pipes. Aluminum Paint made with Alpaste has high opacity. Its reflective quality brightens plant interiors, cuts lighting costs.

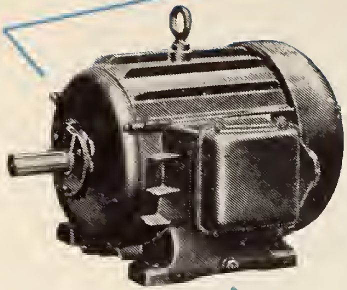
ALUMINUM COMPANY OF CANADA, LTD.

Producers and Processors of Aluminum for Canadian Industry and World Markets

MONTREAL • QUEBEC • TORONTO • VANCOUVER • WINDSOR

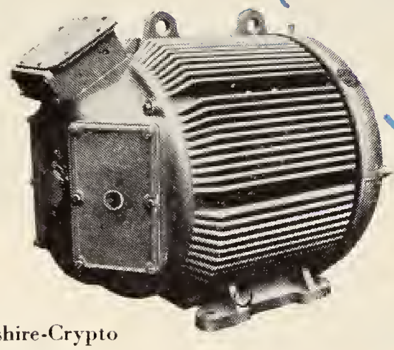
COOLER

Totally ENCLOSED MOTORS

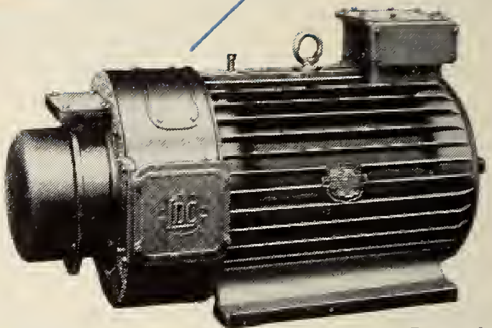


Crompton-Parkinson
"KLOSD"
Squirrel Cage Motor

Crompton-Parkinson
"KLOSD" Flameproof
(Buxton Tested)
Vertical Spindle
Flange Mounting



Lancashire-Crypto
"FANKULD"
D.C. Motor



Lancashire-Crypto
"FANKULD"
Wound Rotor Motor

BEPCO'S

MORE EFFICIENT COOLING

. . . gives you a 50° c. Rise Motor instead of 55° c. Rise — resulting in

MORE RESERVE POWER

The construction of Crompton-Parkinson's "KLOSD" and Lancashire-Crypto's "FANKULD" motors provides a large, clean radiating surface ensuring rapid dissipation of heat and so resulting in a cooler running motor . . . a motor with more reserve horsepower. There are no internal ducts to become choked with dust and dirt or to corrode. Just a plain ribbed surface that is easily kept clean.

9-2

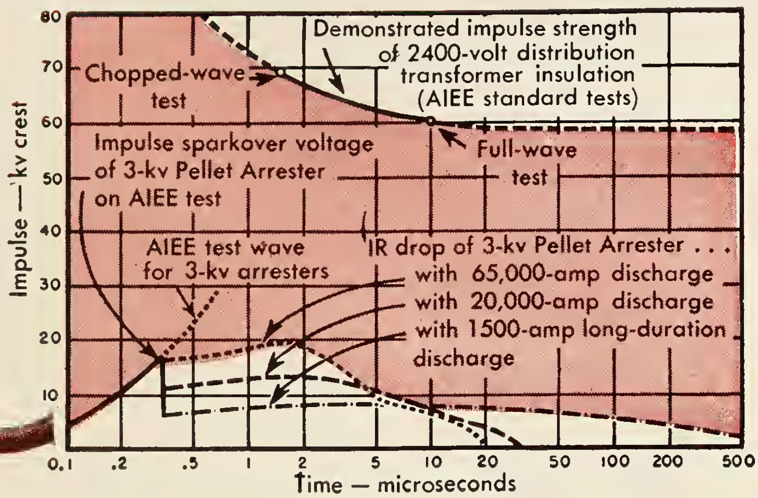
BEPCO CANADA LIMITED

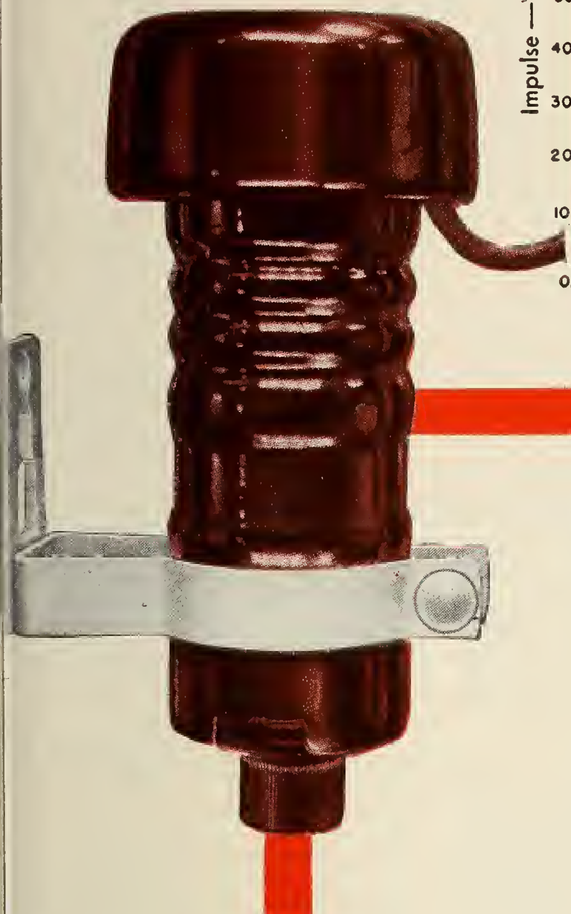
TORONTO MONTREAL VANCOUVER

No other distribution arrester

Protects

. . . so well





e G-E Pellet arrester is also "tops" for durance. Pellets are of lead peroxide— distinctive valve element, self-protecting ainst service moisture — unaffected by ndensation, or humidity. Pellet arresters ve large discharge capacity—they withind easily the AIEE and NEMA standard ,000 ampere impulse test.

GENERAL ELECTRIC

Pellet Arresters

This graph, made from actual volt-time and ampere-time cathode-ray oscillograms, demonstrates the protection afforded distribution transformers by the G-E Pellet arrester. No other distribution arrester limits lightning voltages so low for small, medium or high lightning currents.

This co-ordination chart is based on the 3-kv arrester protecting a 2400-volt transformer. Similar charts for Pellet arresters of higher ratings protecting higher voltage class transformers demonstrate the same advantages in unequalled margin of safety in protection. This *extra protection* results from the combination of low sparkover voltage and exceptionally low IR drop, that together hold lightning voltages to lower levels than does any other distribution arrester.

You buy better protection when you buy Pellet arresters!
The Quality-Standard of the Industry for more than 25 years.

49-HB-1

CANADIAN GENERAL ELECTRIC

COMPANY LIMITED

HEAD OFFICE: TORONTO—Sales Offices from Coast to Coast

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 386*)

dustrial equipment for the mining, steel and pulp and paper industry. The territory to be served by Mr. McKie extends from North Bay to Sault Ste. Marie.

•

A. P. Craig has been appointed vice-president and director of Manufacturing of Canadian Westinghouse Co. Ltd. Mr. Craig will be in charge of all manufacturing activities of the company.

•

The new Toronto address of the Alliance Electric Works Limited is 600 Bay Street, Room 208. The telephone number is WA. 1253.

John R. Read

John R. Read has retired from the presidency of Canadian Westinghouse Co. Ltd. Mr. Read retains the office of chairman of the board of directors. He joined the Company, in 1904, as district office electrical engineer and salesman in Vancouver, B.C. Three years later he became district office manager and held that post until 1937, when he was transferred to the Company's head office as a vice-president. He was elected to the presidency of the Company in 1939, and chairman and president in 1944. Mr. Read was awarded the O.B.E. for his outstanding contribution to Canada's war effort.

•

Dr. J. H. Ross of Montreal, consultant chemist, has been appointed a member of the board of directors of the Crown-owned Canadian Arsenals Limited. The announcement was made by the Right Hon. C. D. Howe, Minister of Trade & Commerce, Hon. M.E.I.C. Dr. Ross succeeds Edward T. Sterns who died earlier in the year.

For his work, during the war, as director of research investigation, chemicals and explosives division, Department of Munitions and Supply, Dr. Ross was awarded the M.B.E. He is now a partner in the Montreal firm of Donald, Ross and Company, consultant chemists and chemical engineers.

A. C. Wickman (Canada) Limited have appointed Vulcan Iron & Engineering Ltd. of Winnipeg as their representatives for the Prairie Provinces. The Vulcan organization has been active in the West for three quarters of a century. J. W. Stinson will be in charge of the activities of the newly-created agency.

•

A. C. Wickman (Canada) Limited have been appointed Canadian representatives of The Gairing Tool Company of Detroit, Mich.

•

A. L. Brown has been elected president of Dominion Sound Equipments Ltd. Previous to his new appointment he was manager of the general sales division of the Northern Electric Company. He succeeds M. P. Murphy, who is now vice-president and general manager of Northern Electric.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

The Metron Instrument Company, of 423 Lincoln Street, Denver 9, Col., have released Bulletin No. 99 which describes the Company's miniature variable-ratio speed changer. This single page folder describes the product in a most concise manner.

•

Taylor Instrument Companies of Canada Limited, 110 Church Street, Toronto, have a limited number of copies of a publication entitled "Taylor Technology". This periodical, which is produced quarterly, is highly informative, and production is excellent. The Winter 1948 issue, which was used for purposes of review, contains articles on the following subjects: "Instrumentation at one of the World's Largest Textile Mills", "Flow Measurement of Gases and Liquids through Primary Elements in Pipe Sizes of less than two inches", "The Application of Automatic Control to Retorts in a Canned Food Plant", "Force Balance Unit Measures Level or Pressure of Corrosive and Viscous Fluids", "Errors in Measuring Wet and Dry Bulb Temperatures in Industrial Dryers".

•

J. K. Smit & Sons of Canada Limited, 129 Adelaide Street West, Toronto, manufacturers of industrial diamond tools, have available a 62-page brochure-type catalogue in which are described the manufacture and uses of diamond tools. The publication is most informative. A smaller publication on "Diamond Oil Well Bits" is also available.

•

A 38-page illustrated brochure, describing the wire and cable production facilities of Canadian General Electric Company, is offered to Institute members. This booklet should be of interest to those who are concerned with the uses of wire and cable of all types. Ask for the brochure "Wire & Cable Manufacturing", and address your enquiry to the nearest C.G.E. office.

•

The April 1949 issue of The "Bepco Journal", published by Bepco Canada Limited, 4018 St. Catherine Street West, Montreal 6, Que., contains an article on A.C. generators as manufactured in the Bruce Peebles Works of the company. Members of the Institute will be placed on the mailing list for this publication, on receipt of request.

The Trane Company of Canada Ltd., Mowat Avenue at King Street West, Toronto, will be pleased to place readers of the "Journal" on the mailing list for the Company publication "Trane Weather Magic". The publication is now in its tenth volume. The subjects covered should be of interest to many of our readers.

•

Pilkington Glass Ltd., 27 Mercer Street, Toronto, have available a number of publications produced by their parent company, Pilkington Brothers Limited, of St. Helens, Lancashire, England. Among these publications is one, "Glass Insulators", in which are given dimensional sketches and specifications of the various types of glass insulators manufactured by the Company: "Toughened Glass Insulators" an article reprinted from the "Electrical Review" of September 1947: "The Development of a Pre-Stressed Glass Insulator" by P. M. Hogg, member of The Institution of Electrical Engineers of Great Britain and reprinted by permission from 'The Journal of the Institution of Electrical Engineers." The Company will also make available to our readers "Glass Age News", a quarterly publication.

•

Ann Arbor Instrument Works, Ann Arbor, Mich., will be pleased to send a complimentary set of the "Truckenmiller Tensile Testing Experiments". In return for this material the applicant must agree to supply the Company with the following data: "Departments in which materials testing is taught and department heads." "Teachers in charge of testing." "Number of students enrolled in testing materials each year." This offer should be of particular interest to student members.

•

Canadian Ingersoll-Rand Co. Limited, Post Office Box 40, Montreal 2, Que., will be pleased to supply copies of a four-page bulletin describing the "Impactool", which can be used for drilling, reaming, tapping, nut running, screw driving, boring, stud driving, wire brushing, etc.

•

A new 16-page illustrated bulletin on "Watthour Meters" is available from any office of the Canadian General Electric Company. Meter engineers and superintendents, and others interested in single phase metering, will find the bulletin useful for reference purposes. Ask for bulletin CGEA-3114A.

•

Caterpillar Tractor Co., of Peoria 8, Ill., have produced an interesting 16-page booklet entitled "Profiting Through Earthmoving The Caterpillar Way". This publication should be most useful to members in the contracting and construction field.

•

Readers who are interested in receiving "Aluminium News", published monthly by Aluminium Union Limited, are invited to forward their requests to C. R. Ellis, Editor, Aluminium News, Box 6090, Montreal, Que.

•

A new descriptive bulletin, fully illustrated, describing the Silentvane "10" series fans, has been released by the B. F. Sturtevant Company. Requests should be addressed to either the Toronto or Montreal offices. The Toronto address—19 Melinda Street; the Montreal address—620 Cathcart Street.

•

The Richmond Screw Anchor Co. Inc. of New York, has announced the publication of their 1949 catalogue. This catalogue is in the nature of an engineering guide to give the concrete contractor, and the concrete form builder, complete information on the use of Richmond equipment. Of special interest is a chart showing concrete pressure on the form in pounds per square foot for various rates of concrete in the form in feet per hour, and for various liquid heads of concrete with correction for temperature at the time of pouring. Copies of this catalogue are available from Air-Conditioning Engineering Co., (Canada) Limited, 79 Vitre Street W., Montreal, Que.

•

The McColl-Frontenac Oil Company Limited, Royal Bank Building, St. James Street, Montreal, are the Canadian distributors of a publication "Lubrication" published by The Texas Company of New York. The May 1949 issue contains an interesting article on "Machine Tool Lubrication on the Production Line" which is most informative. Copies of the publication, or reprints of the article, are available in limited quantities.

•

The Esterline-Angus Company Inc., P.O. Box 596, Indianapolis 6, Ind., manufacturers of graphic instruments, offer their publication "The Graphic". A sample bulletin No. 549—was forwarded to the editor for review. It contains a complete description of model AW recording milliammeters.

•

"The Alcan Ingot" published by the Aluminum Company of Canada, Ltd., is an 8-page publication which is issued monthly. It is of a semi-technical nature. For copies, write to the Company at the Sun Life Building, Dominon Square, Montreal.

•

The Internatonal Electrolytic Plant Co. Ltd., Sandycroft, Chester, England, have published a most informative brochure "Oxygen and Hydrogen Production". It is a 28-page publication in which is described Knowles patent electrolytic cells for the production of pure hydrogen and oxygen.

•

"Electro Design", 445 St. Peter St., Montreal, offers a pamphlet entitled "The Moving Finger Shows". This pamphlet describes an instrument which prevents over-drying in yarns or fabrics. It should be of particular interest to engineers in the textile industry.

•

Canadian Liquid Air Company Ltd. will be pleased to place readers of the "Journal" on the mailing list for "The Welding Review". This interesting company publication has been published continuously for the past twenty-four years. It is highly regarded by readers in the welding field. Address requests, for addition of names to the mailing list, to Division EWS, Canadian Liquid Air Company Ltd., 1111 Beaver Hall Hill, Montreal.

•

Caterpillar Tractor Co., Peoria 8, Ill., have issued a new booklet stressing the use of Diesel power by industry. Graphically and pictorially illustrated, the publication presents questions and answers on the various problems confronting industrial power users in the equipment field. Copies of this publication may be secured by asking for Form 12113. The brochure is printed in two colours and contains 12 pages.

Coating Crews prefer No-Ox-Id!

IT'S EASIER TO USE . . . EASIER TO APPLY

When coating a pipe line against corrosion, it's important to have the coating crews on your side—enthusiastic about the material you give them to work with.

NO-OX-ID is the rust-preventive coating crews prefer. There's no need for extra protective clothing, face masks, or ointments that are objectionable, particularly in warm weather. Crews know that they're safe from chemical burns; that there are no irritating skin reactions.

Management Likes NO-OX-ID, Too

Pipe-line operators and contractors know that workmen in a good frame of mind mean greater production. They know that NO-OX-ID means savings—reducing labor requirements, savings in bonuses to crews because it is nontoxic, savings on insurance and medical expense, savings on labor turnover.

Next time, specify NO-OX-ID. Phone the Dearborn representative near you, or write direct to us.

NO-OX-ID IRON RUST
REG. TRADEMARK AUG. 27, 1918

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NO-OX-ID IS THE ORIGINAL RUST PREVENTIVE

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 32 — MONTREAL, JULY 1949 — NUMBER 7

"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

★ ★ ★

PUBLISHED MONTHLY BY

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Indexed in The Engineering Index

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CONTENTS

12,500 copies of this issue printed

COVER PICTURE

The cover illustration is of the Salgina Bridge in Canton Grisons, Switzerland, which was designed and built in 1930 by the late Robert Maillart.

Biographers of Maillart have recorded that the unusual and radical form of his bridges led to continuous struggles against official opposition and public apathy, and resulted in the erection of most of them in remote valleys of Switzerland.

He had a particular sensitivity, an almost intuitive understanding, of the forces which act upon a structure. His bridges verged sometimes on the statically impossible, but even his opponents could hardly deny that they were exciting and beautiful.

The development of the Saguenay System

by

F. H. Duffy, M.E.I.C.

System Protection Engineer, Aluminum Company of Canada Limited, Arvida, Que.

A paper presented before the Saguenay Branch of The Engineering Institute of Canada.

The author reviews the changes made necessary in the system switching arrangements and circuit breaker duties, as its growth developed from the original generating station at Isle Maligne to the present system comprising three plants with a fourfold increase in capacity.

This paper will briefly review the development of the 2,000,000 hp. Saguenay Hydroelectric System and some of the major problems involved in system arrangements to maintain circuit breaker interrupting duties at a satisfactory level, without loss of flexibility in switching facilities and load transfers. The development of the Saguenay System will be considered in four stages only:

(1) The System with the Isle Maligne power house and various mill loads, and the Arvida substation and interconnections with the Shawinigan and Price Brothers Systems (Figure 1).

(2) The addition of Shipshaw No. 1 or Chute-a-Caron power house (Figure 2).

(3) The addition of Shipshaw No. 2 power house (Figure 3).

(4) The Saguenay System as it is today (Figure 4).

Although various changes have been and are being made continually as is usual on any power system of this size, these minor stages in the development did not always coincide with the addition of one of the power houses. Except for Shipshaw No. 2, the power houses themselves, for that matter, were only completed over a period of years. For the purposes of illustrating O.C.B. duties and system growth, however, it is probably sufficient to consider the four steps mentioned.

The Saguenay System lies in the basin of Lake St. John and the valley of the Saguenay River, and its water supply consists of Lake St. John with its easily developed natural storage at the headwaters of the Saguenay, and Lake Manouan and Passe Dangereuse in the Lake St. John watershed at both of which storage dams were constructed.

Figure 1 shows a one line diagram of the first stage of the development, the Isle Maligne power house, completed in 1926. It consisted of twelve, 30,000 kva. (later rebuilt to 35,000 kva.), vertical waterwheel units, operating at 112.5 r.p.m. under a 110 ft. head, and at a voltage of 13.2 kv. These twelve units were first operated in parallel on a 13.2 kv. bus with all loads supplied from the same bus. Power for Arvida was supplied by means of step-up transformer banks rated 75,000 kva., 13.2/154 kv. and two 154 kv. transmission lines to the substation at the Arvida aluminum reduction plant 23.5 miles distant. An interconnection was made with the Shawinigan Water & Power Company system by means of 13.2/187 kv. transformers and a double circuit tower line, 135 miles to the Quebec Terminal Station. Various other loads were supplied radially at generator voltage or by means of step-up transformers at 110 kv. and 69 kv.

Under these conditions, the maximum O.C.B. duty for a three-phase fault on the 13.2 kv. generator bus was about 1,150,000 kva. and all O.C.B.'s connected to the bus were rated 1,500,000 kva. interrupting duty by the manufacturer. The 154 kv. O.C.B.'s were rated at 1,500,000 kva. also and the maximum O.C.B. duty for a 154 kv. line-to-ground fault was only about 765,000 kva.

Chute-a-Caron Plant Added

Figure 2 shows the second step in the growth of the system when the first stage of the Shipshaw development, Chute-a-Caron powerhouse, was placed in operation, and when the Arvida reduction plant substation was increased in size to use this extra power. The Chute-a-Caron station consists of four, 60,000 kva., 13.2 kv. generators operating at 120 r.p.m. under a head of 155 ft. The unit system of construction was used, that is one generator, one step-up transformer bank, and one transmission line to Arvida, where provision was made to parallel all lines on a 154 kv. bus.

A few years later two additional 154 kv. transmission lines were constructed between Isle Maligne and Arvida substation and the 154 kv. bus and switching structure installed at Isle Maligne was extended. Additional transformer bank capacity was also added at Isle Maligne to increase the power delivery to the 154 kv. system. Under these conditions line-to-ground faults on the Arvida and Isle Maligne 154 kv. busses were increased in magnitude to about 1,200,000 kva. and all new O.C.B.'s installed were rated at 2,500,000 kva. interrupting capacity. The O.C.B. duty on the Isle Maligne 13.2 kv. bus was increased to about 1,300,000 kva. for a three-phase fault.

In 1941 it became obvious that the completion of the Shipshaw development would be necessary to meet wartime aluminum production demands. An a-c network analyser study was made to determine the most satisfactory system arrangement, for conditions of load, system stability and fault current magnitude. Various possible methods of limiting fault currents were considered, such as the use of bus reactors to sectionalize the Arvida 154 kv. and Isle Maligne 13.2 kv. busses. From the standpoints of cost, flexibility, future developments and fault current limitation, a system of transformer bank ties appeared to have most advantages. Operating experience and system changes since that time have amply justified the adoption of this arrangement.

As a stop-gap until Shipshaw generators could be operating, two generators were installed in an extension to the Chute-a-Caron power house, and a metallic tie (rather than transformer tie) was made between the Isle Maligne end of the two tie lines to Quebec, and the 154 kv. bus. This latter expedient provided a means of obtaining greater deliveries of power from the Shawinigan system, and also made available additional bank capacity at Isle Maligne as both of the 13.2/187 kv. step-up transformer banks may be operated at 154 kv.

At Chute-a-Caron two generators and their associated step-up transformer banks were paralleled on each of two lines. Therefore, under these conditions, the system arrangement was not greatly changed from that shown in Figure 2, although there was some increase in fault current magnitudes and O.C.B. duties both on the 154 kv. system and the Isle Maligne 13.2 kv. bus.

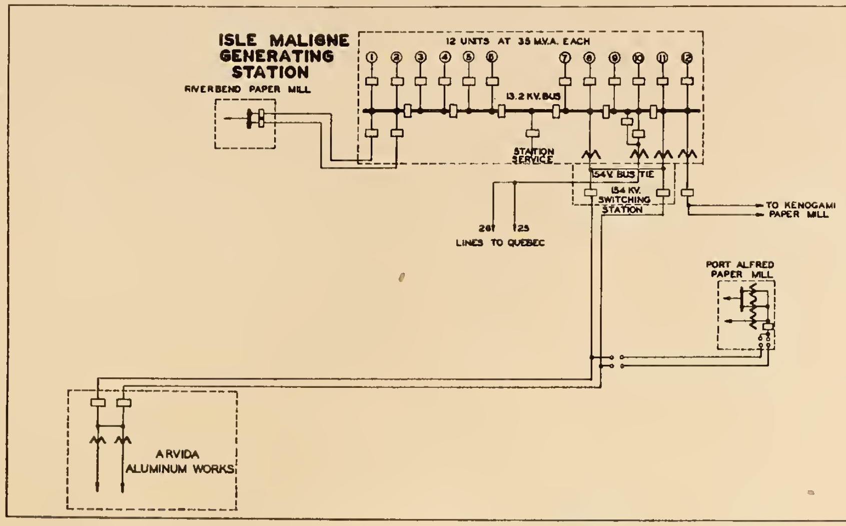


Fig. 1. Saguenay System, 1926.

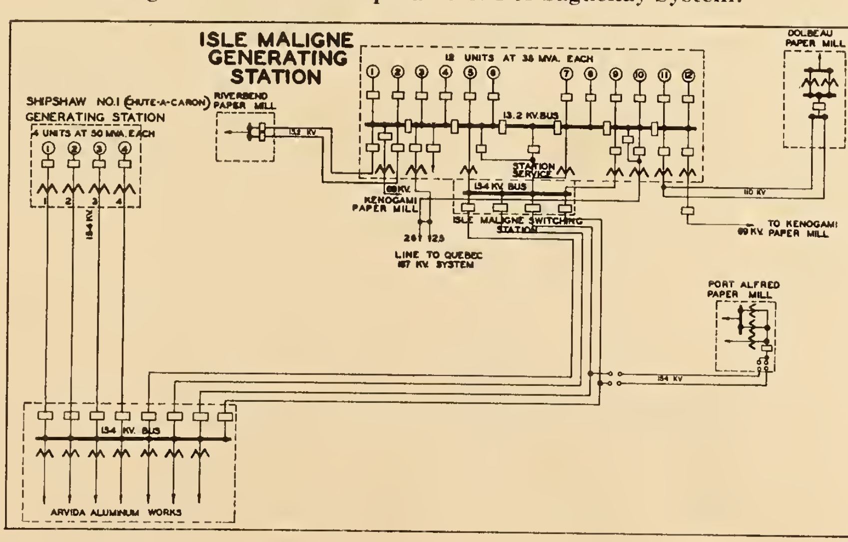
Wartime Changes when Shipshaw Added

From 1942 to 1943 the twelve Shipshaw generators were added to the system. Again the arrangement used was the unit system, as can be seen in Figure 3. The Arvida substation was enlarged and the 154 kv. transmission network was redesigned at the time, to provide flexible switching and transfer facilities under foreseeable loading conditions, and to limit fault currents to within circuit breaker interrupting capacities.

The major feature was the division of the system into three subsystems on the Arvida 154 kv. bus. An interconnection between the three sections for the transfer of synchronizing power and load balancing, as well as to limit fault currents as decided from the a-c. network analyser studies, was provided by means of three 90,000 kva .transformer banks at Arvida.

Previous to this time all power transformers had their neutral point on the 154 kv. wye connection solidly grounded. With the addition of Shipshaw it became imperative to reduce the magnitude of the ground fault currents on the 154 kv. system due to the large capacity of solidly grounded power transformers in this restricted area. It was decided to solidly ground only certain banks on each subsystem at the Arvida substation. The remainder would be operated with their neutrals connected to ground only through a lightning arrester. This arrester would solidly ground the bank at voltages approaching the rating of the transformer neutral graded insulation. This procedure would

Fig. 2. Addition of Shipshaw No. 1 to Saguenay System.



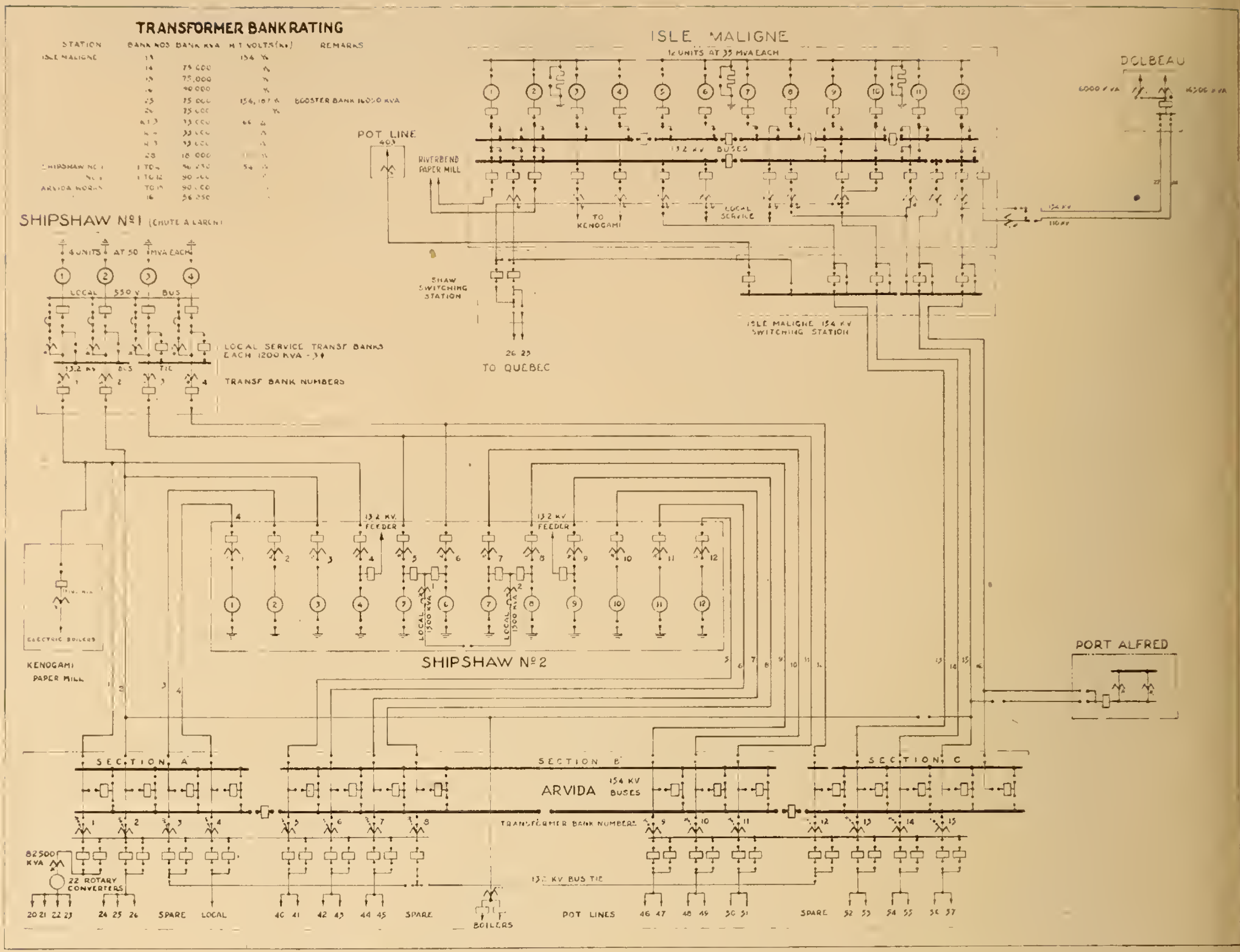


Fig. 3. Saguenay System after addition of Shipshaw No. 2, 1942-1943.

limit ground fault magnitudes to a value less than if all banks were solidly grounded.

At about the same time a 13.2 kv. bus was installed at Chute-a-Caron power house, to provide duplicate tie facilities between the 154 kv. subsystems. This arrangement allows the system sections to be paralleled when emergency conditions make it necessary to use one of the Arvida tie banks for load supply. After Shipshaw was added to the system it was no longer necessary to maintain the metallic tie with the Shawinigan System at Isle Maligne, but the facilities remain available should their use be again required.

Maximum 154 kv. line-to-ground faults on the three subsections for this condition of operation were about 1,600,000, 2,100,000 and 2,300,000 kva. respectively, and circuit breaker duties were of course somewhat lower. Circuit breakers whose interrupting capacity was limited to 1,500,000 kva. were used on the subsystem having the lower fault currents, and thus their rating was not exceeded.

It should be noted that, with the exception of the Isle Maligne units, all generators on the Saguenay system have their neutrals solidly grounded. This is permissible since in practically all cases the generators operate isolated from other machines. Experience has shown that at Shipshw, iron burning during generator faults has been negligible. Split-phase relays have helped this condition by detecting faults in the generators before they reach major proportions.

At Isle Maligne, however, a grounding bus is provided and only one generator on any one 13.2 kv .bus section has its neutral connected to this bus. Each grounding bus section is connected to ground through a resistor, the value of which has been changed for different grouping of generators on the 13.2 kv. bus.

About 1945 the circuit breakers on the Isle Maligne 13.2 kv. bus were derated by the manufacturer to a maximum interrupting duty of 955,000 kva. It had been realized previously that the Isle Maligne 13.2 kv. circuit breakers were inadequate and studies were started to decide what improvements could be made. Calculations showed that to reduce interrupting duties below circuit breaker capacities would necessitate segregating the units at Isle Maligne. Also at this time a decrease in the aluminum reduction load indicated that in some cases complicated switching procedures were necessary to obtain proper load transfers and to fully use generator capabilities.

Present Rearrangement of System

The Saguenay system as it appears today is shown in Figure 4. It was decided to rearrange the system to provide normal two sec-

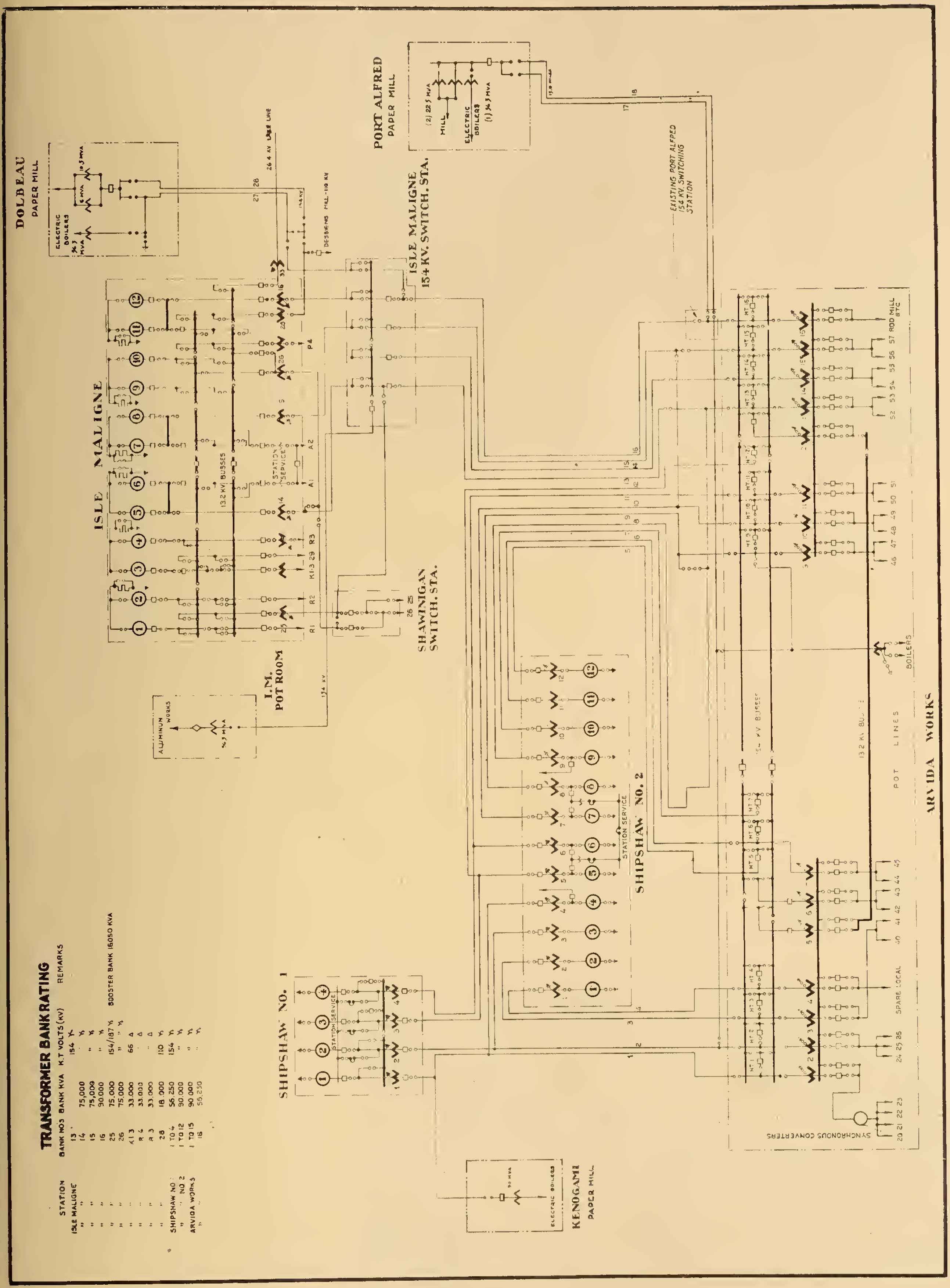

TRANSFORMER BANK RATING
DOLBEAU PAPER MILL
PORT ALFRED PAPER MILL
ISLE MALIGNE
ISLE MALIGNE 154 KV. SWITCH. STA.
SHAWINIGAN SWITCH. STA.
I.M. POT ROOM
SHIPSHAW NO. 1
SHIPSHAW NO. 2
ARVIDA WORKS
KENOGAMI PAPER MILL

Fig. 4.

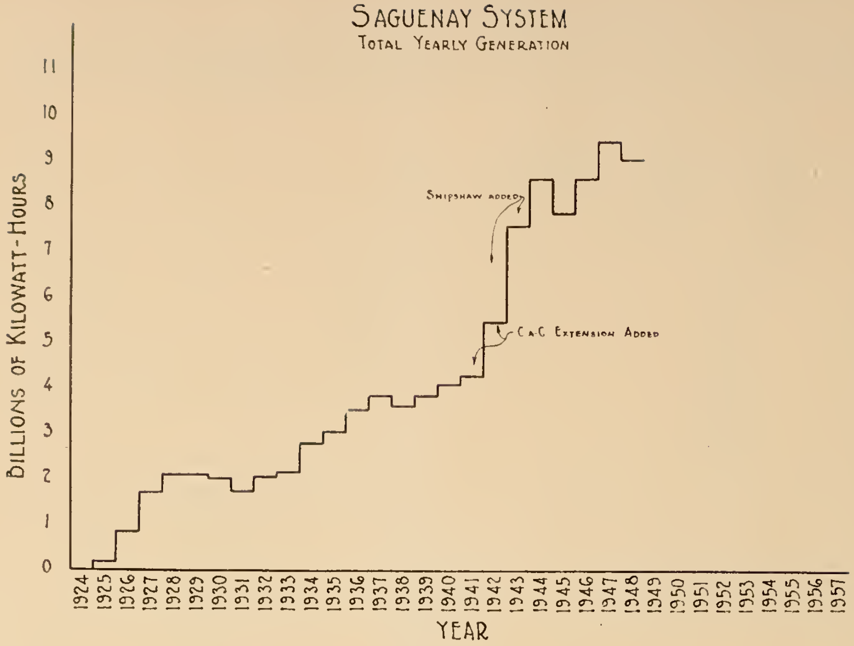


Fig. 5.

tion operation on the Arvida 154 kv. bus, with provision to return to three sections should conditions warrant. At Isle Maligne, generators were arranged in groups of two units with a radial step-up transformer bank and facilities for paralleling as many groups of two as desired on one bus. In the present arrangement the neutral bus is divided into six sections, one for each two generator group and the ground connection from each neutral bus is made through a 1.8 ohm resistor.

Provision is also made for solidly grounding each neutral bus section. The segregation of the two unit groups is not quite complete at the present time due to difficulties in obtaining the necessary equipment. One two unit group remains to be isolated. The advantages of the changes at Arvida were an increase in system flexibility and operating efficiency as well as the release of several 154 kv. circuit breakers for use elsewhere and a decrease in the number of tie banks necessary.

Maximum 154 kv. line-to-ground fault currents are about 2,400,000 kva. for each of the two main system sections. On an Isle Maligne 13.2 kv. bus section consisting of three generators, a one bank tie to the 154 kv. system, and to the 187 kv. interconnection the maximum three phase fault will be about 900,000 kva. Circuit breaker interrupting duties will be less than these values. In the system shown in Figure 4, all circuit breakers on the 154 kv. system having an interrupting rating of 1,500,000 kva. have been removed from positions where their rating may be exceeded.

The majority of 154 kv. system faults involve only one phase and ground, and because of the number and concentration of grounded neutral power transformers. For this reason fast, selective clearing of faults is obtained by means of induction type relays with instantaneous attachments located in the neutral connection of the phase current transformers on the Arvida and Isle Maligne 154 kv. circuit breakers, and in the neutral ground connection of the main power transformer banks at all other stations. Reliable back-up protection is provided by phase overcurrent and/or impedance relays. Major faults on the 154 kv. system which have been cleared quickly by the neutral relays have not disturbed the interconnection between the Saguenay and Shawinigan systems when it was heavily loaded. Slow clearing of minor

TABLE 1

Saguenay System Generators

Station	*Isle Maligne*	*Chute-a-Caron*	*Shipshaw*
No. of units	12	4	12
Kva. rating	35,000	50,000	10 — 75,000 2 — 71,500
Speed (r.p.m.)	112.5	120	128.6
Frequency (cycles/sec.)	60	60	60
Voltage (kv)	13.2	13.2	13.2
Power factor	0.80	0.90	10 — 0.80 2 — 0.90
Wr^2	33,500,000	68,920,000	5 — 73,017,000 5 — 82,178,000 2 — 71,462,000
Winding	4 par'l star	4 par'l star	10 — 8 par'l star 2 — 4 par'l star
Head (feet)	110	155	208

TABLE 2

Saguenay System Power Transformers

Station	*Isle Maligne* (1)	*Chute-a-Caron*	*Shipshaw*	*Arvida* (2)	*Port Alfred*	*Kenogami*
No. of 3 phase banks	9	4	12	16	3	1
Kva rating	3 — 75,000 2 — 90,000 3 — 33,000 1 — 18,000	56,250	90,000	2 — 56,250 14 — 90,000	2 — 27,000 1 — 56,250	90,000
Voltage Kv. L.T. (nominal)	13.2 Delta	13.2 Delta	13.2 Delta	13.2 Delta	2 — 2.2Delta 1 — 6.6 Delta	6.6 Delta
Voltage Kv. H.T. (nominal)	3 — 154 Wye 2 — 187 Wye 1 — 110 Wye 3 — 69 Delta	154 Wye	161 Wye	154 Wye	154 Wye	154 Wye

(1) Banks with less than 18,000 kva capacity not shown.
(2) Includes I.M. potroom bank.

faults, however, has resulted in an out-of-step condition causing loss of synchronism between the two systems. It might be noted that the stability studies made on the a-c. network analyser indicated this.

Insofar as possible all busses, both 154 kv. and 13.2 kv., and all transformer banks are provided with current differential protection for rapid clearing of internal faults. In addition all major transformer banks are provided with gas detector relays. Experience has shown that these may be relied on to detect practically all incipient transformer faults before a major breakdown develops.

Fast, reliable differential protection is provided on all generators, and in addition the Shipshaw generators have split-phase protection which has proved fully satisfactory. Ground fault protection is provided by neutral overcurrent relays on all generators which have their neutral solidly grounded.

System operating arrangements are continually checked on a d-c calculating board at Shipshaw, in order to avoid exceeding circuit breaker interrupting ratings, and in order to maintain proper coordination of all relay settings.

Conclusions

Extensive planning, prior to the outbreak of war, enabled the system to be rapidly expanded when the emergency arose. Though conditions which have arisen were not always those which were expected, it is felt that problems involving major changes have been dealt with effectively and efficiently as they occurred. At the same time all necessary changes have been carried out in a manner such as to reduce outages on system equipment to a minimum with very little or no loss in system operating efficiency, or decrease in equipment protection. A graph showing load growth on the Saguenay system from its inception until the present time is shown in Figure 5.

Figure 6 is a photograph of Isle Maligne generating station, while Figure 7 shows Shipshaw station with Chute-a-Caron in the background. Table I provides comparable statistics on the generators at the three generating stations and Table II gives transformer bank data for all stations. The size and quantity of equipment installed as indicated by these photographs and tables provides some idea of the magnitude of the Saguenay system.

Fig. 6. Isle Maligne generating station.

The author wishes to acknowledge the assistance of Mr. F. L. Lawton of the Aluminum Laboratories Limited, and Mr. H. J. Kirkpatrick of the Aluminum Company of Canada, Limited, in providing valuable suggestions and criticisms.

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Fig. 7. Shipshaw station, with Chute-a-Caron in the background.

INDUSTRIAL USES of RADIOACTIVITY

by

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National Research Council, Chalk River, Ont.

An address delivered before The Engineering Institute of Canada, Montreal Branch, February 17, 1949

Tracing the history of natural radioactivity back to its earliest stages in the late "nineties", the author discusses the theory, laws and experiments related to it, down to Chadwick's discovery of the neutron in 1932. Means of producing radioactivity were discovered in 1934. Describing the theory related to artificial production, he shows how fission of Uranium has changed the entire conception. A few examples of the uses of isotopes in pure and applied research are given, as well as a long list of their uses in process control in industry. Dangers can be avoided by careful observance of regulations, while benefits can be derived from employment of isotopes in industrial production through the services of scientists at Chalk River. A few of the factors which are retarding the advent of atomic power are mentioned.

In order to describe some of the uses of radioactivity in industry, let us first of all deal briefly with some of the fundamental concepts of radioactivity, in order to give a fuller understanding of this relatively new and interesting field. The Chinese have a proverb which states that one picture is worth ten thousand words. We could go one step further, and say that one demonstration experiment is worth ten thousand pictures. These fundamental concepts will then be demonstrated by a few, simple experiments. The methods of production of the radioactive materials will be described briefly, as well as some uses in industry, both potential and actual.

Most of us are probably familiar with the discovery of radioactivity. Becquerel, a French physicist, found that a piece of pitchblende, a uranium bearing ore, would cause a photographic plate to be darkened, even though the plate was covered by a protective wrapping. This discovery had far-reaching repercussions. It helped scientists find out a great deal about the constitution of matter, and as a result, of atomic structure. It will be recalled that the atom, the smallest part of matter which was chemically identifiable, was once considered to be a hard indivisible core, electrically neutral. The classical researches of Rutherford and others had shown that this was not true. The atom was found to consist of a hard central core, positively charged, called the nucleus, around which in definite orbits circled electrons like planets around the sun. These electrons were negatively charged, keeping the entire atom neutral. It was not very long before it was realized that the nucleus itself had a structure, and this structure has not even yet been completely determined.

As far as is known, the nucleus consists of protons, that is, positively charged particles which are the nucleus of the lightest element known, hydrogen. The remainder of the mass is made up by uncharged particles called *neutrons* which have now become a by-word in this Atomic Age of ours. The number of protons in the nucleus determines the position of the element in the Periodic Classification of the Elements.

Neutrons and protons have a weight equal to 1 mass unit, while the electrons are almost weightless. Hydrogen, the first element in the table, has an atomic weight of 1, contributed by the proton, and to make the atom electrically neutral, is encircled by one electron which is negatively charged. Helium, the next element, has an atomic weight of 4, and a nuclear charge of 2. The charge of 2 is given by two protons, the remainder of the mass by 2 neutrons. Thus if the nucleus has p protons, its atomic number, which determines its position in the periodic table, will be p and all atoms with p protons in the nucleus will behave identically in chemical reactions. If n be the number of neutrons, then $n + p =$ mass number of the nucleus.

To go on to the next element, lithium is third in the periodic table. It has an atomic number of 3, that is, 3 protons in the nucleus, a mass number of 7; therefore this is made up by 4 neutrons. However, it was soon found out that a different type of lithium also existed. This still had 3 protons in the nucleus, else it would not be chemically identifiable as lithium, but instead of an atomic weight of 7, it had one of 6; in other words, only 3 neutrons in the nucleus. Hydrogen occurring in nature was also found to consist of two types of hydrogen. The second type had a mass number of 2, still had a nuclear charge of 1; that is, the hydrogen nucleus now consisted of one proton plus one neutron.

In nuclear shorthand we can abbreviate this as follows, with the mass number as a superscript and the atomic number or charge by a subscript adjoining the symbol of the element.

	p	n
${}_1H^1$	1	0
${}_1H^2$	1	1
${}_1H^3$	1	2
${}_2He^3$	2	1
${}_2He^4$	2	2

These atoms which have the same number of protons, but different numbers of neutrons are called *isotopes*. They have identical chemical properties and thus are extremely difficult to separate.

Radioactivity

Now as we continue this study of the elements as they occur in nature, we find as we approach the end of the Periodic System that after element 83 the elements are unstable, giving off various types of radiations; that during this process of instability new atoms are formed, which differ physically and chemically from their parent atoms. To this phenomenon the name of radioactivity is given. Since a new type of atom has been formed, it can be seen that, to accomplish this, the radiations which were given off must have come from the nucleus of the atoms; that p, the number of protons, must have changed.

These radioactive atoms give out three possible types of radiation, α rays which were shown by Rutherford in a classical experiment to be the nuclei of helium atoms, i.e., ${}_2He^4$, with a mass of 4

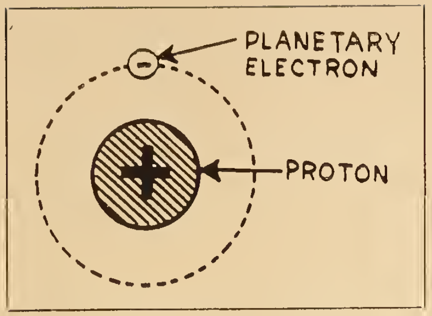


Fig. 1. Diagram of Hydrogen atom.

and a positive charge of 2 units; β rays which are electrons, with a negative charge of 1, and are essentially weightless, but which do not come from the extra-nuclear electrons which circle the nucleus; and γ rays which are short X-rays or electromagnetic waves.

There are many ways of detecting these radiations, but all of them depend on the ionizing properties of the radiation. α rays ionize material very readily, and thus are very easily absorbed, as we can see by this simple experiment. Suppose we have an ionization chamber which is connected to an amplifier. As an α particle enters the chamber it ionizes the air, and causes a

Table I—THE PERIODIC TABLE

Periods	Group 0	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII
Formula of highest oxide	—	R_2O	RO	R_2O_3	RO_2	R_2O_5	R_2O_6	R_2O_7	RO_4
Formula of hydride	—	RH	RH_2	RH_3	RH_4	RH_3	RH_2	RH	—
First short period	He *2* 4.003	H *1* 1.008 Li *3* 6.940	Be *4* 9.02	B *5* 10.82	C *6* 12.010	N *7* 14.008	O *8* 16.000	F *9* 19.00	
Second short period	Ne *10* 20.183	Na *11* 22.997	Mg *12* 24.32	Al *13* 26.97	Si *14* 28.06	P *15* 30.98	S *16* 32.06	Cl *17* 35.457	
First long period, Even Series	A *18* 39.944	K *19* 39.096	Ca *20* 40.08	Sc *21* 45.10	Ti *22* 47.90	V *23* 50.95	Cr *24* 52.01	Mn *25* 54.93	Fe *26* Co *27* Ni *28* 55.85 58.94 58.69
First long period, Odd Series		Cu *29* 63.57	Zn *30* 65.38	Ga *31* 69.72	Ge *32* 72.60	As *33* 74.91	Se *34* 78.96	Br *35* 79.916	
Second long period, Even Series	Kr *36* 83.7	Rb *37* 85.43	Sr *38* 87.63	Y *39* 88.92	Zr *40* 91.22	Cb *41* 92.91	Mo *42* 95.95	Ma *43*	Ru *44* Rh *45* Pd *46* 101.7 102.91 106.7
Second long period, Odd Series		Ag *47* 107.880	Cd *48* 112.41	In *49* 114.76	Sn *50* 118.70	Sb *51* 121.76	Te *52* 127.61	I *53* 126.92	
Third long period, Even Series	Xe *54* 131.3	Cs *55* 132.91	Ba *56* 137.36	La *57* 138.92	Ce *58* 140.13				
Third long period, Odd Series			The Rare Earth Elements Pr *59* to Yb *71*						
Fourth long period, Even Series					Hf *72* 178.6	Ta *73* 180.88	W *74* 183.92	Re *75* 186.31	Os *76* Ir *77* Pt *78* 190.2 193.1 195.23
Fourth long period, Odd Series		Au *79* 197.2	Hg *80* 200.61	Tl *81* 204.39	Pb *82* 207.21	Bi *83* 209.00	Po *84*	—*85*	
Fifth long period	Rn, An, Tn *86* 222	—87	Ra *88* 226.05	Ac *89*	Th *90* 232.12	Pa *91*	U *92* 238.07		

burst of current which we can then hear amplified on a loud speaker and see on the oscilloscope. A sheet of paper cuts them out almost entirely.

Here we have a source of β and γ radiation. A sheet of paper hardly attenuates the radiation at all, but a sheet of aluminum cuts out the β radiation completely. The γ rays are however very penetrating and, as we can see, several inches of lead are necessary to absorb them completely. The greater the energy of the β or γ radiation, the more difficult it is to absorb, and thus we come to the first fundamental property of radioactive materials, the *energy of the radiation.* This is usually expressed in million electron volts, written "Mev".

All of the radioactive elements do not emit radiations at the same rate. It was shown by Rutherford and Soddy that the transformation follows a simple exponential law:

$$N = N_o e - \lambda t$$

where N_o = No. of atoms present at any time

t = time

N = No. of atoms which will remain unchanged after time t.

λ = a constant, characteristic of the atom, known as the disintegration constant.

The rate of disintegration

$$-\frac{dN}{dt} = \lambda N.$$

If we consider a quantity $t_{\frac{1}{2}}$, which is called the *half-life* of the element or isotope, i.e., the time for $\frac{N}{N_o}$ to equal $\frac{1}{2}$, then this quantity $\frac{1}{2}$ is another fundamental characteristic of the radioactive atom, and may serve along with its energy to identify it. The half-life can be demonstrated by several simple experiments. Since the parent element is being transformed into an element which differs physically and chemically from itself, then separations by the above methods are possible. Consider a solution of thorium nitrate. Thorium is the parent of a long series of radioactive daughters which may be pictured as follows:

$$_{90}Th^{232} \xrightarrow[1.4 \times 10^9 \text{ yr}]{\alpha}$$

$$_{88}Ra^{228} \xrightarrow[6.7 \text{ yr}]{\beta} {}_{89}Ac^{228} \xrightarrow[6\text{ h.}]{\beta}$$

$$_{90}Th^{228} \xrightarrow[1.9 \text{ yr}]{\alpha} {}_{88}Ra^{224} \xrightarrow[3.6 \text{ d}]{\alpha}$$

$$_{86}Rn^{220} \xrightarrow[54.5 \text{ s.}]{\alpha} {}_{84}Po^{216}$$

It will be noted that wherever an α particle is lost, the mass is decreased by 4 units and the charge by 2. The loss of an electron from the nucleus causes no appreciable change in mass. A negative charge is removed, and therefore by some internal mechanism the nucleus now must have one more positive charge and the atomic number is increased by 1 unit. It can be seen in the above family that the half-lives of radioactive materials can vary a great deal, in this case from millions of years to a few seconds.

If some air is blown over the solution, the radon, which is a gas, will be removed and will be blown into the ionization chamber. The amplified pulse can now be heard over the loud speaker and seen as bursts on the electroscope. The active gas has a half-life of 54.5 seconds and the decrease in the number of bursts is readily evident. If the number of pulses per unit time were timed, it would soon be evident that they decrease to half their value in 54.5 seconds.

Similarly a chemical means of separation may be used to illustrate the same point. Ru^{106} is a β emitter with very low energy. It is too soft, in fact, to be usually detected, since it is entirely absorbed before reaching the counter. However, it has a daughter element as follows:

$$_{44}Ru^{106} \xrightarrow[\beta]{1\text{ yr.}} {}_{45}Rh^{106} \xrightarrow[\beta^-]{30\text{ secs.}} {}_{46}Pd^{106} \text{ (stable)}$$

The ruthenium can be solvent-extracted out of this solution, leaving the rhodium daughter to decay with a 30 second half-life. If we place the solution of Ru + Rh in front of this aperture in the lead block shielding the counter, then it will be noticed that the counter gives the same number of counts per unit time. If we now add some tetrachlorethane and shake the mixture, and allow the layers to settle, then place the original solution in front of the hole in the lead block so that it may be " seen " by the counter, then the activity will decay. If the results were plotted, plotting the logarithms of the counts per minute against time, then a straight line would ensue with a slope giving us the half-life of the material.

The above illustration may also be used to show the genetics of radioactive materials. The Ru is constantly decaying. If the tetrachlorethane solution were now placed before the aperture we would see that the Rh is regenerated in the solution. It is important to remember that these radioactive constants are characteristics of the substance. No physical or chemical means have yet been found which would stop, hasten or retard these processes.

Discovery of Artificial Radioactivity

The question arising in the reader's mind, no doubt, is the following: Radioactivity was discovered in 1896; why are we being told of its uses only at this late date? The answer is an easy one. Until 1934 the only radioactive materials available were those which occurred in nature. They occur, with very few exceptions, only at the end of the periodic table and are limited in scope generally by their chemical properties and their availability. It was shown in 1934 that by bombarding elements with particles produced, for example, by a cyclotron, that new radioactive elements could be produced. This discovery of artificial radioactivity showed that greater possibilities for radioactive materials existed.

Several important factors made the application of radio-isotopes very difficult even at this time. The yield was very small, making the cost very great. The fundamental unit of measurement in radioactivity is the *curie*, which is used to denote an activity equal to that of 1 gram of radium in equilibrium with its decay products—3.7×10^{10} disintegrations per second. One millicurie of C^{14}—an active isotope of carbon produced by cyclotron methods, cost about $1,000,000 to produce, certainly a prohibitive figure except in microcurie amounts, useful only in academic studies.

The production of radio-isotopes was given a tremendous impetus by the discovery of the neutron by Chadwick in 1932. Previous attempts to cause nuclear interactions with particles like protons had always encountered a serious difficulty. The positively charged nucleus had repelled the particle, and only chance hits were scored, giving very low yields. It was found that the neutron, being an uncharged particle, could make its way to the nucleus and interact with it without suffering any electrostatic repulsion. The production of neutrons in the laboratory is relatively simple. If we bombard beryllium with α-particles we get the following reaction:

$$_4Be^9 + {}_2He^4 \longrightarrow {}_6C^{12} + {}_0n^1$$

Ordinary carbon is formed, plus neutrons. This reaction is exothermic and the neutrons will have high energies.

If these neutrons are slowed down, i.e., relieved of some of their energy, they will react with other materials to a much greater extent. For this slowing-down process we can use materials like paraffin, graphite and heavy water, D_2O, where the light isotope of hydrogen has been replaced by the heavier one. These materials are not only efficient in slowing down the neutrons, but have the added advantage of not absorbing very many neutrons themselves, thus leaving the neutrons free to react with the desired materials.

This may be demonstrated by mixing a source of α-particles, a fraction of a gram of radium, with beryllium powder in a platinum capsule and placing the capsule in a paraffin block. If an ordinary 25-cent piece is placed in the paraffin block near this source of neutrons the following reaction will occur:

$$_{47}Ag^{109} + {}_0n^1 \longrightarrow$$

$$_{47}Ag^{110} \xrightarrow[2.3\text{ min.}]{\beta} {}_{48}Cd^{110} \quad \text{(stable)}$$

The silver captures a neutron and transforms itself into an excited state. To stabilize itself, it emits a β-particle, giving us the element next to it in the Periodic Table, cadmium. When the quarter is taken out and placed near the counter, it will be found to have become radioactive, but the activity quit rapidly dies away. We are actually doing the reverse of what the alchemist tried to do. We are taking a precious metal and turning it into a baser one.

This method of producing radioisotopes has been used quite extensively, and still is being used in small laboratories. Its disadvantage is that the alpha particles bombarding the beryllium nucleus are positively charged. The positively charged nucleus repels them, and thus the yield of radioactive material is again very low.

The discovery of fission of uranium changed all this. It was discovered that if U^{235} were interacted with a neutron, the result would not be a change to the next element in the Periodic System, but a rupture of the atom. This may be compared to a large drop of water. If a small driblet is added to it, surface tension forces cause it to break into two with the loss of several small driblets. From a nuclear point of view, this can be represented as follows:

$$_{92}U^{235} + {}_0n^1 \longrightarrow {}_{92}U^{236} \longrightarrow$$

$$_{z_1}X_1^{A_1} + {}_{z_2}X_2^{A_2} + {}_0n^1 + \text{energy}.$$

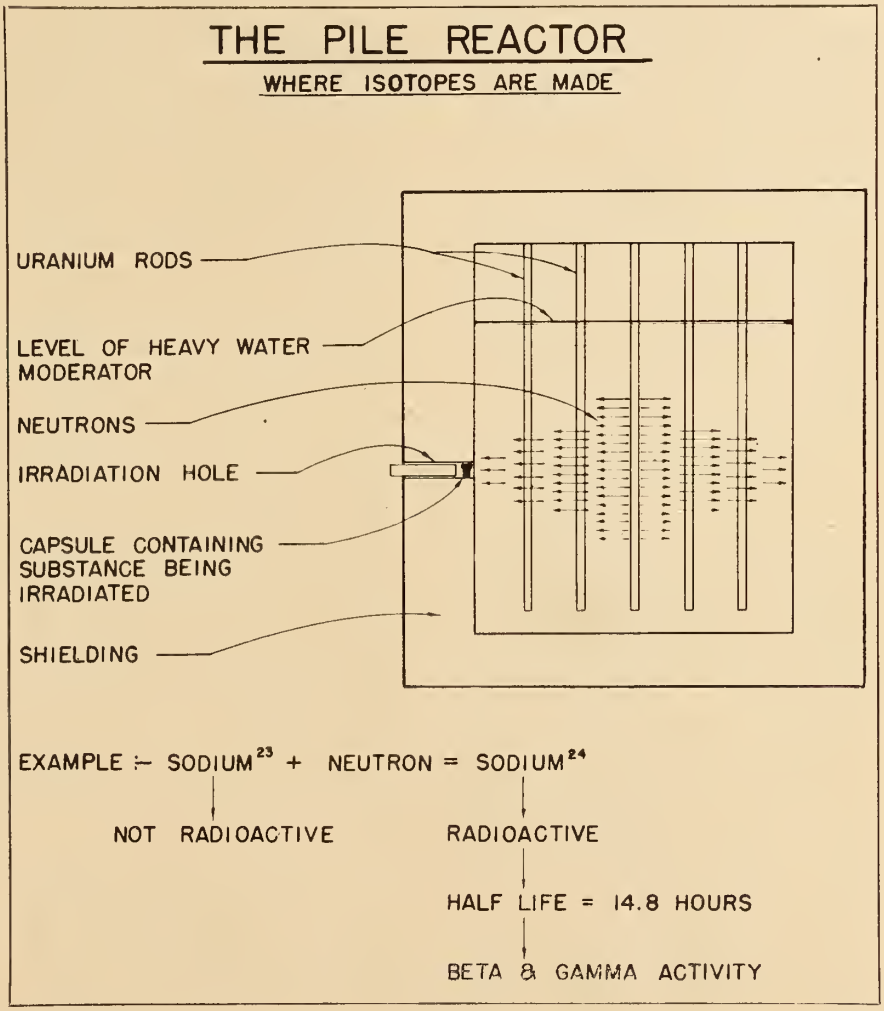
It was found that the number of neutrons produced was greater than 1. The excess neutrons could go about doing some more splitting, with the release of more neutrons etc., and a chain reaction occurs. This, in very simple language, is what is occurring in the nuclear reactors or "piles" of which we have two at Chalk River. These piles are designed to produce an amount of neutrons in excess of that required for their operation. These neutrons can then be used to activate materials and in this manner active isotopes of every element can be produced. Unfortunately, some of these, like oxygen and nitrogen, are too short-lived to be useful. Others like iron, carbon, sulphur, iodine, chlorine or a host of others can, however, very conveniently be used. In Fig. 2 we see a schematic view of the pile and the way radioactive materials are produced.

The production of these isotopes is done relatively cheaply, e.g., the millicurie of C^{14} which by cyclotron methods cost about $1,000,000 to produce, can now be obtained from Chalk River for about $50. There is also another source of these isotopes available. In the reaction above (fission of U^{235}) elements X_1 and X_2 are themselves radioactive in many cases. Here, in what may be termed the waste products of nuclear reactors, can be found many radioactive elements which can be produced in no other way.

Uses of Isotopes in Pure Research

The fundamentals of radioactivity and methods of production of radioactive materials have been dealt with, because only with a definite and distinct understanding of them can a full realization of their possible uses be had. A few simple experiments will now show

Fig. 2.



how these materials can be used, and will outline very briefly some uses which others have made of them. Following this we can then discuss health hazards, regulations and availability of materials, ending with a short discussion of atomic power. The uses of isotopes have been divided into 3 main categories, pure research, applied research and process control.

Pure research is the lifeblood of science and a constant source of information for industry. In this field radio-isotopes used as "tracers" can be very effective. It must be remembered that the radioactive atoms will act the same chemically as the stable atoms, and that by the radiations emitted we have an easy means of determining the identity and location then, not only of the "active" atoms but of the stable ones. We can easily see how this will be useful in studying exchange reactions, reaction kinetics, catalytic poisons, etc. With the very sensitive electronic equipment now readily available the limits of analysis have been extended in a hitherto undreamed-of manner.

In certain cases it is now possible to accurately estimate as little as 10^{-17} of a gram. You can readily see how the solubility of sparingly soluble substances may be determined, and how vapor pressures of metals can be studied. C^{14} can be incorporated into a host of organic compounds and organic reactions studied. It is obvious that in a lecture of this type these topics can only be outlined in a generalized form, but a study of the scientific literature over the last few years will confirm that a new scientific technique has been developed as a by-product of the search for the atomic bomb.

Uses in Applied Research

There are also many uses in Applied Research. Take a block of material which has been rendered radioactive, and another piece of metal that is non-radioactive. If we now rub the two pieces of metal together, by the friction engendered we will transfer some of the radioactive atoms to the second block. This can be seen if we hold the second block near the counter. This gives research laboratories a more sensitive method of doing friction studies than has ever been known before.

The Socony Oil Co. are doing lubrication tests in this manner, using radioactive iron. By this method they can measure quantities of materials which are transferred from surface to surface, or surface to lubricant, and can estimate as little as one millionth of a microgram. The Goodrich Rubber Co. is using this method to do friction studies on rubber tires. Several motor car companies are investigating the wearing of bearings, piston rings, etc., by this very simple, yet highly satisfactory method.

Leakages along pipes or tanks may also be detected in a similar manner. If a radioactive substance were added to the liquid, and a detector used, the exact point of leakage could be determined by the radiation emitted. This is not to imply that present methods used for this purpose are unsatisfactory. It is but an additional method of doing a very old job. You may recall that by the use of fluorescein, it was proved that a subterranean channel existed between the Rhine and the Danube. Fluorescein is a chemical which can be detected in extremely small quantities. This is using stable "tracers" for the same type of job.

Many flotation problems could be solved with C^{14} which may be incorporated into the flotation agents. This permits a determination of surface area, the dynamic properties of the mineral to agent bond formed, the preferential attachment of collector ions to a mineral surface and the concentration of controlling ions in a flotation pulp.

In fertilizer studies, using P^{32} incorporated into the fertilizer, much information may be obtained as to the proper time of addition of fertilizer, and where it should be placed for most efficient utilization. The suitability of various materials as fertilizers may be determined. It is really the only way in which the uptake of artifically added fertilizer may be distinguished from that present in the soil originally. This can be traced to the various parts of the plant, e.g., leaves, stem, seed, etc. As a matter of fact, it is possible to follow the phosphorus from the fertilizer to the plant, from the plant to the food, from the food to the consumer and then back to the fertilizer again.

In the coking of coal, S^{35} has been used to determine whether the source of sulphur in coke is due to pyritic or organic sulphur. Active pyrites were made and mixed with 12 tons of coal and a determination made which could have been done in no other manner.

Radioactive materials have also been used in measuring field concentration of sprayed materials. Radioactive manganese was dissolved in DDT, which was sprayed from an airplane. The ground field concentration was then easily determinable. S^{35} has been used by the Goodrich Rubber Co. to study problems associated with the vulcanisation of rubber. These are but a few of the examples which can be shown, but they will give an idea of what can be done.

Uses in Process Control

In Process Control, measuring changes in the thickness of materials can be done very easily by radioactive methods. Consider a sheet of paper of varying thickness, mounted on rollers. Under it is a source of radioactive material, S^{35} in this case. Above it is an ionization chamber. As the paper is moved along over the source the radiation measured by the ion chamber remains constant, as long as the thickness of the paper remains the same. As can readily be seen and heard, it is decreased when the paper becomes thicker. This ion chamber can be connected to a warning bell or to the rollers, and the sheet may then be kept uniform automatically.

Such an apparatus is actually used by several of the rubber companies for measuring thin sheets of film about one thousandth of an inch thick. The usual mechanical gauge compresses the film between a metallic foot and an anvil. The theory is that the weight of the foot will provide the same pressure, but the softness of the material affects the result. Meters formerly were of dubious value in measuring a difference of 1/10,000 of an inch. Now, using a source of C^{14}, without actually touching the material, a change of 1/100,000 of an inch may be measured, and by refinement this of course can be extended. Similarly, the wall thickness of a container may be measured. A bottle chosen at random from the laboratory store-room has a small amount of P^{32} in it. As it is rotated in front of the counter, the difference in wall thickness of the glass is readily seen.

The height of a liquid in a tank may be determined, using a radioactive source. Other methods, where the tank is inaccessible, or the liquid too viscous for example, may be inconvenient. The source is floated on the liquid, an ionization chamber at the top or bottom of the tank will register greater or lesser intensities as the source approaches it or moves away. Other applications of this principle, such as measuring wall thicknesses of pipes without calipers can readily be suggested.

In steel-making, short-lived radio silicon could be added to the charge entering an open hearth furnace. This would enable minute by minute control of the Si content of the steel, without the necessity of laborious chemical analyses. In the production of high grade steels, phosphorus must be scavenged from the melt by the addition of slag-forming materials, and a continuous check on the P content of the steel is desirable. This can be done by chemical analysis, but it is much simpler to use radio-phosphorus, P^{32}.

A well-established method in oil detection is the method of well-logging. A source of neutrons or gamma rays is lowered in a drill-hole. By the reflection off the walls of the hole an estimate may be made of the type of rock formation present, and the possibility of the presence of oil-bearing shales found.

Industrial radiography of castings is now an accepted procedure. For this purpose expensive X-ray equipment or large amounts of expensive radium have hitherto been necessary. It is possible with the Chalk River pile to produce in a relatively short time the equivalent of many grams of radium at a fraction of the cost. Radioactive cobalt, Co^{60}, is very convenient for this purpose. Less energetic gamma emitters may also be obtained which would be useful in radiographing thin metal plate or coatings of metals with low atomic number like aluminum.

As a final example, radioactive sources may be used to remove electrostatic charges from moving belts, paper or cloth and thus eliminate the possibility of dust explosions.

Danger and Benefits from Isotopes

It will be noted that any suggestion has been avoided of the incorporation of any long-lived radioactive material into products which would be allowed to go on the open market. Radioactive materials can, if not handled properly, be very dangerous, and adequate safeguards are necessary. To demonstrate the spread of radioactivity is very simple. If we simply uncork a bottle containing radioactive iodine, the active material will soon reach the ionization chamber at the other end of the table. This not only gives an indication of how activity may be spread, but also of the sensitivity of the method of radioactive detection.

It is obvious that some sort of regulation or control is necessary to prevent the incorporation of radioactive materials into things like toothpaste, etc. This has been taken care of by the Atomic Energy Regulations now in force. Space does not permit going into the health aspect of this problem, but on the basis of years of research in the radium industry and a very concentrated effort in the atomic energy field, a backlog of information now exists which is readily available.

Chalk River is now in a position to make available to industry many of the fruits of our intensive effort in the atomic energy field. The development of atomic energy since the war has taken a new direction, focussing attention upon beneficial peacetime applications. It has now reached a point where a new industrial technology is possible. To focus interest on this new field, the Rt. Hon. C. D. Howe, under whose jurisdiction the National Research Council lies, has suggested that during the year 1949, the more commonly used radioisotopes be made available to industries, free of charge. To supplement this we have on our staff several men whose chief aim is to act as consultants to industrial concerns, and the services of these men are available for the asking.

Factors Delaying Atomic Power

No talk on the industrial uses of radioactivity would be complete without at least a passing reference to atomic power. The factors hindering the utilization of atomic power at this time are real ones. It is not true, as some have maliciously suggested, that this development is being hindered by huge power monopolies. The Atomic Age, as it has been called, is only 6 years old. After all, one must remember that it took more than a century to make the energy conversion from coal 25 per cent efficient. At Chalk River we are now generating heat from nuclear fission at the rate of many kilowatts. Unfortunately, this heat is generated at such a low temperature that efficient generation of electricity is not possible.

The problems which at present face those working on atomic power are great. The heat to be efficiently utilized must be released as high temperature heat. To do this, structural materials must be used which will stand up to high temperatures. Unfortunately the materials commonly used for this purpose absorb neutrons and cannot be used inside a nuclear reactor. Those which do not absorb neutrons undergo corrosion very rapidly and lack mechanical strength. When to this problem are added problems like disposal of radioactive wastes and chemical extraction problems, then some estimate of the difficulties involved will be realized.

But, even though atomic power is not realizable at present, yet it is hoped that the reader's interest has been stimulated, and that he has been made to realize that a legacy has been left us, a by-product of the search for the atomic bomb, in the form of cheap radioactive materials. The extent to which these will be used depends only on the ingenuity of industry.

EMERGENCY RAILWAY BRIDGING

by

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This paper was prepared from the author's field notes and was read before the Vancouver Branch of the Institute on January 19, 1949. It describes the emergency measures carried out to restore railway communications in the Elk, Nicola, and Thompson River Valleys after the disastrous floods in the spring of 1948.

A brief introduction indicates the extent of the flood conditions and the author then deals with each crossing in turn, describing the damage caused by the flood waters. In each case he presents an appreciation of the necessary repairs, details of their accomplishment, and a brief reference to the permanent repair schemes under way or completed at the time of writing.

The part played by the Royal Canadian Engineers in the demolition of the C.P.R. Bridge over the Nicola River exemplifies the ready assistance which can be given by the army in times of national emergency.

Heavy snowfall in the Canadian Rockies during the winter 1947-48, when affected by the sudden warmth of a late spring, resulted in an unusually heavy run-off. The discharge of many rivers within the Pacific drainage area exceeded any previously recorded under hydrometric data as prepared by the Surveys and Engineering Branch of the Department of Mines and Resources.

For comparison, the mean monthly discharge of the Elk River during freshet season from 1913 to 1942 was recorded at Elko, B.C. as 7,040 second feet and on May 24th, 1948, the discharge was 21,200 second feet. Even this reading may have been increased, because the gauge was displaced after the reading was taken. However, it indicates that there was a tremendous increase in the volume of debris laden water which battered against bridge piers and abutments.

The three rivers considered in this article are the Elk River, the Nicola River and the Thompson River, and the railway crossings of these streams are discussed in that order.

Where valley bottoms are wide and comparatively level, it is not difficult to observe the various courses in which a river has chosen to flow, when diverted by natural log jams or artificial obstructions or when spread over the entire floor of the valley. Frequently the ideal crossing appears where the broad flat bottom enters a narrow rock-walled pass and the river in freshet season is forced to turn up on edge and flow through. In either case bridge foundations must be deep or well protected from scour, as is clearly indicated in the following photographs of C.P.R. Bridge 52.6, Cranbrook Subdivision, over the Elk River, C.P.R. Bridge 18.0, Merritt Subdivision, over the Nicola River, and the C.N.R. Bridge 28.8, Ashcroft Subdivision, over the Thompson River.

Elk River Crossing

C.P.R. Bridge 52.6 over the Elk River, originally located and built about 1912, consisted of two 150-ft. through truss spans with a short approach fill on the east bank and a fill of approximately 400 ft. on the west bank. The east abutment and river pier were supported on wood piling below the bottom of the stream bed. The base of the west abutment was carried down 12 ft. below river bottom and rested on coarse gravel.

During the years following its construction, the main channel had gradually shifted towards the west bank and, at one time, had eroded back of the west abutment which was temporarily repaired by 40 ft. of timber pile trestle, later filled and heavily rip-rapped.

About May 21st, 1948, the extreme flood conditions undermined the west abutment causing noticeable settlement on the upstream end. C.P.R. crews immediately dumped cars of heavy rip-rap at this end but, as the Elk River continued to rise, this and 110 ft. of approach fill were washed away, leaving track ties suspended by the steel rails. The upstream end of the abutment settled approximately 5 ft., throwing the west end of the through truss 3 ft. 6 in. upstream of

Fig. 1. (left) The Dominion Bridge Company's 25-ton locomotive crane with steam hammer in position for driving H piling under the first vertical truss members of the Elk River Bridge. The timber piling for the temporary track can be seen against the face of the damaged abutment and several of the steel H piles are visible inside the portal of the truss.

Fig. 2. (right) The 108-ft. pony truss of the Nicola River Bridge after settlement of the north abutment.

its original alignment and balancing the span on diagonally opposite corners. The floor beam at the abutment was three feet off level.

The condition of the span appeared not to have been affected in that the fixed end carried on the river pier had pulled the anchor bolts, causing a uniform tilt throughout the span of 2 ft. 3 in. relative to end floor beams.

A timber pile trestle had to be driven to reach the abutment before any attempt could be made to correct the span. Two methods of jacking and supporting the span were considered.

(1.) To straddle the displaced abutment with steel piling, remove the ballast wall and cross cap with a steel grillage to support the span in normal manner at the end bearing; or

(2.) To drive the approach trestle out to the abutment, overreach with driver and place a steel pile bent below the first vertical truss members. Cut the steel piling low, cap and brace to support steel grillage, then jack the span to normal position and erect pedestal pier members to support full dead and live loads. This would also, of necessity, require stiffening of the vertical truss members to carry normal end reaction.

Due to the precarious position of the span and abutment, it was decided to use the second method, as any aggravation of scour by additional obstruction might readily cause loss of the span. Also, any temporary piling at the abutment would hamper the construction of a permanent pier at a later date.

Our task was to design, fabricate and erect the span support as outlined above and, in addition, to construct the remaining 45 ft. of timber trestle approach as work on the approach trestle, commenced by the C.P.R. bridging crew, was suspended when our equipment and crew arrived on June 6th. Railway officials considered their requirements for men and equipment to be even more essential in other parts of the district.

A 25-ton capacity self-propelled locomotive crane with 52 ft. 6 in. boom, swinging leads, and a No. 2 Vulcan single-acting steam hammer was used to drive all piling. (Fig. 1.)

The procedure outlined above was, in principal, closely followed and the main support under the first vertical truss members was constructed of 34 pieces of 10 in. H piling, arranged in 4 bents capped with 15 in. channels and a 15 x 3/8 cover plate, braced with 8 in. channels and welded to form a common pier. A seven pile timber bent was first driven along the face of the abutment and wood stringers placed to bridge the abutment (see Fig. 1), allowing the locomotive crane to advance to position for driving the pier piles. The two centre bents each having eight piles were driven and capped first, and from them the span was jacked up to 2 in. above final position. Then, by use of the roller nests from the displaced abutment, the span was rolled 3 ft. 6 in. downstream to final position. The two remaining steel pile bents were then driven and capped, steel pedestals installed on the cross-cap grillage and the

Fig. 3. (left) Another view of the Nicola Bridge truss showing distortion caused by settlement of the north abutment.

Fig. 4. (right) Sappers from the Army's School of Military Engineering at Chilliwack, B.C., place demolition charges to cut the damaged Nicola Bridge truss.

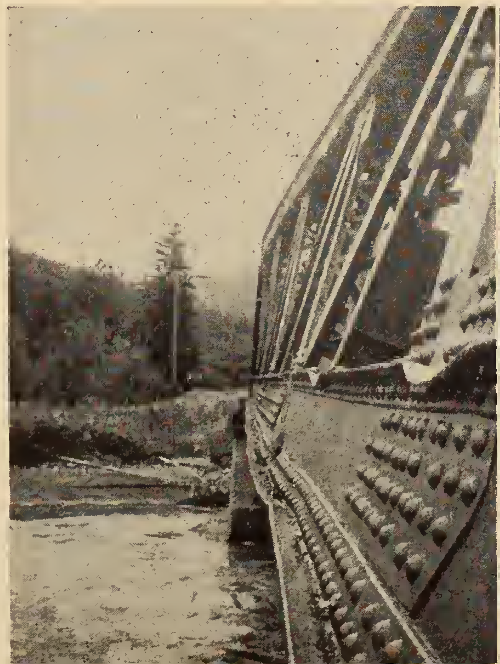


Fig. 5. (left) The Thompson River Bridge after the flood waters had washed out the No. 4 pier.

Fig. 6. (right) The Dominion Bridge and C.P.R. crews prepare the cable anchorage which prevented the collapse of pier 5 of the Thompson River Bridge.

span lowered onto the pedestals.

Bottom chord stiffener angles were added over the new bearings and the vertical posts were reinforced with two 16 x ⅝ plates on each with a strut inserted to reduce post length factor.

The span was opened to traffic on July 18th.

During late fall the old abutment was removed and new piers are now being constructed to replace the timber trestle approach with two 80 ft. girder spans as a west approach to the bridge.

Nicola River Crossing

Alignment of C.P.R. Bridge 18.0 at this crossing point is approximately at right angles to flow. A rock wall bank just upstream of the north abutment increased the flood level considerably and the rush of water into a broader course rapidly removed 60 ft. of gravel bank, dropping the north abutment 3 ft. vertically, with the upstream end finally showing a total settlement of 12 ft. (Fig. 2).

The 108 ft. pony truss span remained fixed to the river pier and to the displaced abutment, causing distortion in practically every main member in the trusses. (Fig. 3).

Two methods of restoring traffic with minimum delay were considered.

At first it appeared doubtful if the span could be salvaged to carry traffic even with the introduction of considerable reinforcing. However, the possibility of raising and reconditioning the span was carefully analysed before it was discarded in favour of the economy and time saving offered by entirely scrapping the span, blowing the abutment clear and building 170 ft. of temporary timber trestle. On this basis, we were asked to remove the span in the most expeditious manner.

As the site was inaccessible by rail from the south (the working end of the job) due to other track washouts, and not immediately adjacent to a highway, the possibility of getting equipment to the site to bring the trusses ashore in one piece or erect temporary falsework was ruled out. Lt. Col. Geo. Lilley, Commandant of the Royal Canadian School of Military Engineering, was consulted and a plan to cut the span in situ with high explosive was considered excellent practical training for a demolition class then assembled.

With two cutting torches, a fair supply of wire rope, guys and slings, and a C.P.R. D7 bulldozer whose operator bulldozed his way down the hillside, the removal of the floor system required only one and one half days.

The demolition party of two N.C.O.'s and twelve sappers with considerable explosive arrived via Burma jeep when the floor system was removed, and began placing cutting charges of gun cotton slabs at quarter points on the top and bottom chords of the upstream truss. (Fig. 4). Our crews placed wire rope leads at four points on the truss and attached them to a short timber, which was allowed to float in the stream, readily accessible for dragging ashore.

The first truss was cut and while it was being hauled ashore, army engineers loaded the downstream truss. The cutting and removal of each truss required one day but the operation of dragging them ashore took considerably more time.

In five days, the entire span was removed to a scrap pile along the south approach fill and railway officials offered a further training opportunity to the Army Engineers in the demolition of the abutment. This was received with enthusiasm.

Five-pound beehive charges were fixed to the face of the concrete abutment and fired, but with amazingly poor results. Many charges penetrated less than 6 inches due to heavy reinforcing of steel rails with no fixed placing pattern. Normal beehive penetration is 26 inches in reinforced concrete and the usual procedure is to deepen by a second charge if necessary, spring and fill with ammonal as a bursting charge. However, in the search for a " soft spot ", a cavity was found under the abutment in about 8 ft of water, and by lowering a sapper with a rope around his waist and an armful of fused 808 as ballast, the first charge was placed. In three trips below water, he placed a most effective charge with considerable ammonal on either side of the fused charge. Other charges above water around the abutment were initiated with the exploder through a ring main circuit. The results were complete and highly satisfactory.

As the last fragment of abutment hit the ground, the C.P.R. crew moved their pile driver onto the site and began driving the temporary trestle approach.

At this writing permanent piers are nearing completion and before the high water of 1949 arrives, it is hoped that the trestle will be replaced with two 80 ft. deck plate girder spans which are being dismantled in Ontario and will be revised in the field to suit condition at site.

Thompson River Crossing

C.N.R. Bridge 28.8 crosses at a bend in the Thompson River with high, well defined banks on either side. The west abutment is anchored in a rock outcrop and the east rests on coarse gravel well above flood level.

The crossing was made in 1914 on a 6° curve and consists of one 80 ft. half deck plate girder span, five 88 ft. h.d. girder skew spans and one 200 ft. through truss span, at the west end. Piers and abutments are concrete resting on coarse gravel bearing. (Fig. 5).

Piers 1 to 6 were carried down to an average depth of 13 ft. below original river bed. There is an overburden of large boulders at pier sites and open cofferdams of timber with steel cutting edges were used in sinking foundations. No piling was used in either bearing or protection.

Water levels recorded are: Low 1093.0 ft., Max. High (1894) 1122.0 ft. with base of rail at 1133.33 ft. High for 1948 was 1110.0 ft.

During the flood of 1948 considerable erosion took place near mid stream and by July 6th, pier No. 4 had completely disappeared and with it spans No. 4 and No. 5. Pier No. 5 had taken a decided list, normal to its long axis. The top of the pier had moved east, on the upstream end 19 inches and on the downstream end 16 inches, and was increasing its outward movement $\frac{1}{4}$ inch per day or normal expansion of the 88 ft. No. 6 girder span. Main line rails had been removed from the deck and the pier and span were free to fall into the river, an occurrence which was expected at any time.

The expansion end of the span being at pier No. 6, the centre line of the main bearing pin had passed $1\frac{1}{4}$ in. beyond the outer edge of the lower base plate, causing considerable stress in the roller nest assembly.

Canadian National bridging crews had placed a temporary staging below span No. 6 in an effort to drive piling and support the span clear of pier No. 5 as it appeared inevitable that this pier must soon follow the fate of No. 4.

Difficulty in placing piles in fast water and the precarious position of the span from which the work could be reached dictated a policy of safety for life and equipment in preference to span value and all work was suspended.

As main line traffic was already diverted over C.P.R. lines, any method suggesting speedy repair was carefully considered by railway officials. One suggestion was to dump the span clear and proceed with timber trestle from each end of the gap. This line of action promised uncertain results as no one would venture to say how or where the span and pier would rest on the river bottom and they might well prove more of a problem below water level than above.

It was decided however, that if pier No. 5 could be tied back to the rock outcrop on the west bank with all ties completely free of the through span and the pier held in its present position until the span was removed, no delay would occur.

It was immediately resolved to attempt the removal of the span by dismantling and we were asked to undertake this work with all available assistance being given by railway company crews. Full responsibility was to be borne by the bridge company.

Our first thought was to prevent the west end of the span from clearing the roller nest. To improve this critical condition induced by daily temperature changes, and to allow time for the pier to be anchored back, heavy timber blocking was placed on the No. 6 pier cap under the end floor beam.

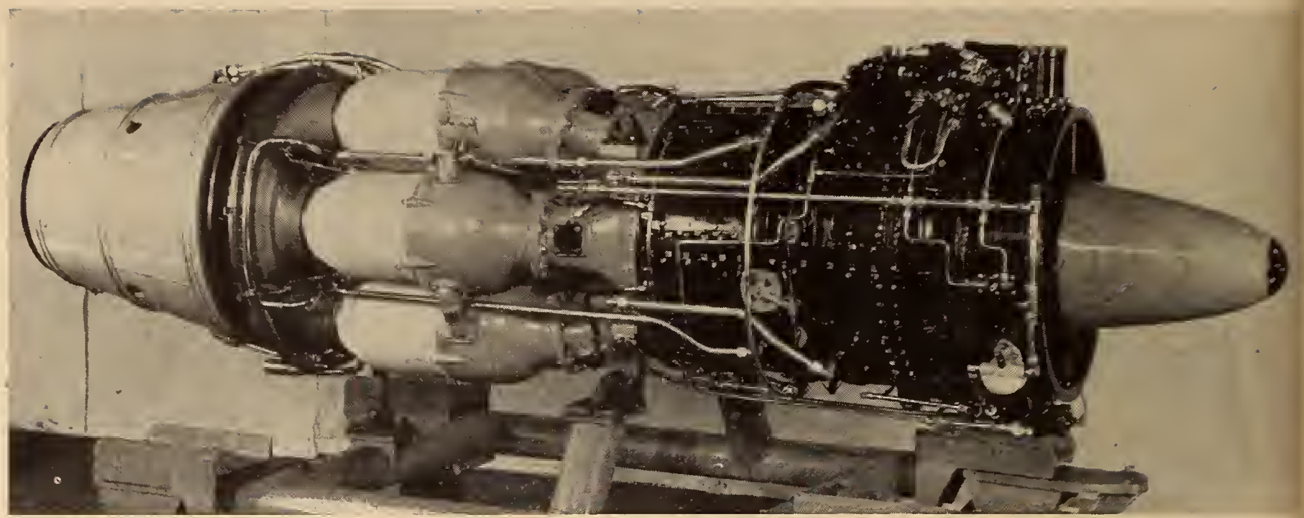
The blocking of the span and its tying back required two and one half days. A $1\frac{5}{8}$ in. dia. wire choker was loosely attached immediately below the pier cap and in the bight a 30 ton single block was shackled, through which was reaved a $1\frac{3}{8}$ in. dia. wire rope from rock anchorage to a D7 bulldozer near the anchor fastenings. The initial pull of 18 tons moved the pier and span 3/16 in. shoreward and this position remained constant throughout the job. (Fig. 6)

The condition of the pier at or near ground line gave considerable concern and it seemed advisable that so long as the span seemed reasonably safe, work should proceed on its dismantling. With the additional precaution of cross lashing the shore end of the span to its pier cap and replacing the roller nests by greased plates to relieve excessive stress in the upper shoe members about the main bearing pins, the span was quite stable and normal expansion and contraction was evident.

Safety nets were hung below the span and the removal of 2,500 field rivets was completed on July 16th. The two-boom derrick car arrived from our Winnipeg branch, was rigged, and dismantling began July 19th. No attempt was made to advance the derrick car out on the span, which naturally made the handling of the far floor beams and stringers a rather awkward procedure. However, the last girder was taken ashore July 23rd after some very anxious moments. (Fig. 7) *(Continued on page 417)*

Fig. 7. (left) The two-boom derrick car about to remove the downstream girder of No. 5 span of the Thompson River Bridge.

Fig. 8. (right) Permanent repair of the Thompson River Bridge was accomplished by replacing piers 4 and 5 with steel towers composed of steel H piles driven to a maximum penetration of 35 ft.



The Avro Chinook

Canada's First Jet Engine

The Avro Chinook is a gas turbine jet propulsion engine, which has been designed and manufactured in Canada for the Royal Canadian Air Force. It is primarily a development engine built to supply the answers for larger jet engines. The engine consists of a 9-stage axial flow compressor, six combustion chambers, a single stage turbine, and an exhaust tail cone.

COMPRESSOR ROTOR—

The compressor has a compression ratio of 4.5 : 1. The rotor is supported at the front end in a self-aligning roller bearing, and at the rear end in a duplex-type ball bearing secured in a self-aligning mounting. The drive for the accessories gear box is taken from the front shaft. The ninth stage disc of the compressor rotor is of steel and the rest of the discs are of aluminum alloy; the blades for the first and second rotor stages are manufactured from stainless steel, and those for stages three to nine from aluminum alloy. The blades are secured by either dovetail or fir tree serrations.

COMPRESSOR STATOR ASSEMBLY—

The magnesium-alloy stator casing is cast in halves, and has one stage of precision cast aluminum alloy guide vanes followed by nine stages of stator blades made from aluminum alloy, and secured to stator rings of the same material.

COMBUSTION CHAMBERS—

Each combustion chamber contains a perforated flame tube of Nimonic 75; the combustion chamber consists of a cast aluminum-alloy front portion and a fabricated mild steel rear portion. The six chambers are interconnected.

TURBINE—

The turbine consists of a Jessop G.18B steel disc with an integrally forged stub shaft, fitted with Nimonic 80 turbine blades which are secured by fir tree serrations at the roots. The stub shaft is mounted in a roller bearing and is connected to the rear end of the compressor shaft through a flexible coupling, which compensates for angular misalignment. The turbine casing is fabricated from stainless steel, and the nozzle guide vanes are of Vitallium.

EXHAUST ASSEMBLY—

The exhaust tail cone and the tail pipe are fabricated from stainless steel. The tail pipe is heat insulated by glass wool blankets encased in shields of silver foil under an aluminum outer covering.

FUEL SYSTEM—

A Lucas duplex fuel injection nozzle in each combustion chamber is supplied with fuel by two Lucas multi-plunger, variable stroke, positive displacement pumps, which are connected in parallel to duplicated manifold pipe lines. Overspeed governors are integral with the pumps, and an interconnected servo-system is incorporated; the maximum delivery pressure is 1,100 lb. per sq. ft. Other components of the fuel system comprise a Lucas flow-control unit with an integral throttle valve, a shut-off cock, low pressure filter, a pressure regulating valve, a combined solenoid and torch ignitor reducing valve, and two torch ignitors.

OIL SYSTEM—

The oil system is of the dry sump type with vane and Gerotor type pumps supplying oil under pressure to the main bearings. One pressure and four scavenge units are incorporated. An integral oil tank, filter, and a pressure regulator complete the system.

STARTER—

The Chinook is started by a Rotax electrical starter operating from a 24 volt d-c supply; two Rotax ignition coils are installed.

LEADING PARTICULARS—

Diameter — 32 in.
Length — 125.1 in.
Frontal Area — 5.6 sq. ft.
Weight — 1,250 lb.
Fuel Consumption (cr.) — 1.00 lb./lb.T./hr.
Oil Consumption (cr.) — 2.0 lb./hr.
Take-off, static — 2,600 lb.T. @ 10,100 r.p.m./sea level
Climbing, static — 2,100 lb.T. @ 9,800 r.p.m./sea level
Cruising, static — 1,900 lb.T. @ 9,500 r.p.m./sea level

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FOOD AND ENGINEERING

by

S. John Wright

London, England

Member, United Kingdom Agricultural Mission to Canada

An address delivered at the Annual Banquet of The Engineering Institute of Canada at Quebec, Que., May 13th, 1949

At the time of the Annual Meeting, Mr. Wright was in Regina as a member of the United Kingdom Agricultural Engineering Mission to Canada. On very short notice, he flew to Quebec to address the Annual Banquet in place of the Premier of Quebec who was prevented by illness from attending.

Mr. Wright tells of the expansion of Britain's agricultural capacity and her efforts to produce as much as possible of the food she requires at home. He outlines the economic obstacles to the free movement of food which is surplus in some parts of the world, to the areas where it is so urgently needed, and concludes by calling upon the engineers in Canada to ensure that Canada's immense resources are developed rationally and that her farming and food production is not neglected so long as any part of the world requires the food she can produce.

Mr. President, Ladies and Gentlemen, I have never before stood up in public with quite such mixed feelings as I have now. To start with, I am pinch-hitting for the Premier of this Province and that means, I am afraid, that I am batting right out of my class. Again, while it is true that in income tax returns and police records I am sometimes described as an engineer, this hardly qualifies me to address this great Institute which includes in its membership some of the most distinguished engineers in the world. In fact I feel about as much out of my element as the Scotsman who dreamt that he was going to heaven. (I ought perhaps to explain that this is an *English* story!) This Scotsman, as you may remember, got right up to the pearly gates, but was refused admittance because St. Peter said they couldn't be bothered to make porridge for one.

Thank You Canada!

There is, however, just one capacity in which I *am* qualified to speak to you; and that is as an ordinary Englishman. And I am quite sure that any one of the millions of ordinary Englishmen who had the honour of addressing a Canadian audience in this old city of Quebec, where so much history has been made, would want to say just three words at the start: THANK YOU CANADA! Thank you for the men, food, and materials you sent to Britain during the war, and for your very generous gifts to us since the war. Thank you, too, for looking after so many of our kids during the dark days. I wish very much that my own had been among them. But when I tried to get them to go, the silly little clucks said, "But Daddy, we may never get into another war". I hope they're right!

But thinking back to what it felt like at home in 1940, I think ordinary Englishmen would want most of all to thank Canada just for being there. We knew you were there, and that you would always be there, no matter what kind of mess we might get into in the meantime.

Farming in Britain

To come now to Food and

S. John Wright

Engineering, I chose this subject in the first place because it seemed particularly appropriate to this occasion. After all you have only to look around you to realize that, among Canadian engineers at any rate, the importance of food is properly appreciated. Food and engineering also sums up very concisely the objects of the British Agricultural Engineering Mission to Canada of which I am a member.

I spoke just now of the monetary gifts and loans which Britain has received since the war ended. We are deeply grateful for them, but we would much prefer not to need them, and we aim at managing without anything of the kind just as soon as possible. Britain needs food, and Canada has plenty of food to sell, but the circumstances are such that we can pay only in exports of goods and services. As you will know, several missions from Britain have visited Canada already to see what can be done to restore a proper balance of trade between us. The idea of inviting this particular one originated with the farmers of Manitoba and Saskatchewan who would be the first to get into difficulties if their wheat and their produce could not readily be sold. They took the view that if a market for their wheat depended primarily on imports from Britain, then farmers themselves should consider what imported goods they might use. And, in all the circumstances, it was highly logical to give special consideration to the possibility of using British made farm machinery and equipment.

Now, at this point, I should like to tell you one or two facts about Britain which you may not have appreciated fully up to now. First of all, we are not just sitting down and waiting for food from overseas to drop into our mouths. We are doing our darndest to grow every ounce of food we can for ourselves. Geographically, of course, Britain is quite insignificant. It only represents an area about one fifth of that of the Province of Quebec; and you could drop the whole of it into a couple of your lakes without really noticing the difference. Nor at first sight is Britain very significant agriculturally, for our whole tillage area is only about one fifth of the tillage area of Canada. But we have a population four times as big as that of Canada and at the moment we are ourselves providing nearly half of all the food we consume. We grow, for example, 400,000 acres of sugar beet and produce enough sugar to cover our whole domestic sugar ration. We have nearly doubled our output of potatoes since 1939; and have now more than doubled our output of wheat, oats and barley. To do all this we had to reduce our livestock pretty drastically. For example, we killed off practically all our hens simply because to produce a 2 ounce egg took about 8 oz. of potential human food; and for the same kind of reason we drastically reduced our proportion of pigs. But we are bringing these things back gradually, and so restoring the old balance of our farming.

I should like also to make it clear that in offering Canadian farmers British made machines, we are not offering them anything that is speculative or untried. Britain today has by far the most highly mechanized agricultural system in the world. Although we live in a country of very small farms, we use substantially more tractors today than are used in the whole of Canadian farming; and of all the tractors and implements that are used, something like 90 per cent are British made.

We had to mechanize our farming during the war because every available man and woman was needed either for the forces or to make munitions. And we have had to continue to develop along the same lines since the war, because with all our farming efforts we cannot grow enough. We still need every available man and woman for export goods — the munitions of peace—just as badly as we once needed them for the munitions of war.

Higher Standards of Nutrition

With this urge behind us we have developed and are still developing new equipment and methods that we think will interest Canada. However, the object of our mission at the moment is not to "sell" anything: we are simply here to study your farming and its requirements so that later on we can offer you goods that will be readily acceptable and no words of mine could adequately express our appreciation of the welcome and cooperation that we are meeting everywhere we may go.

I hope I am not making any of this sound like a hard luck story because in real fact the situation in Britain is not nearly as bad as it is sometimes made to appear. It is true that our standard of living—for what it is worth—is a good deal lower than yours. A week ago I was taken out to dinner at a golf club in Toronto, and since the club had only just reopened for the summer, my host was rather concerned as to whether we should get a proper meal. So he went off to enquire, and presently he came back and told me rather doubtfully that they hadn't a roast on the menu, but could give us chops or steak. I said, "Well, so far as I can see a Canadian steak today is at least as big as an English roast, so we shan't do so badly", and we aren't doing so badly in Britain either. Our standard of living may seem low, but our overall standard of nutrition is probably higher than it has ever been before. Let me give you just one example. Before the war my wife would generally order five or six quarts of milk as a regular morning delivery, and the milkman would come round again during the day to see if she wanted any more. But, of course, most of our milk was produced from imported feeding stuffs. Today with a larger family than we had then, we are lucky if we can get two quarts of milk a day with no asking for more. But the real reason for that is not that we are shorter of milk than we used to be, in fact, even without imported feeding stuffs we are producing substantially more milk now than before the war. The reason is that we are sharing it more fairly. Nowadays all our kids including those from the slums of London, Glasgow and Manchester get free milk every day in their schools. Before the war half of them never saw any milk from one week end to another. Nowadays, too, they can all get a free dinner every day and one that is "off the ration".

No Surplus Food

Nevertheless, food is needed badly enough on the other side of the Atlantic, and when I hear people talking about "surplus" food, I sometimes wonder whether they know what they are talking about. At a luncheon in Winnipeg a couple of days ago for example, I heard it said that Western Canada was the greatest producer of surplus food in the world. *Ladies and gentlemen there is no surplus food in the world today.* What

Canadian farmers are producing is *essential* food, and I hope no one in Canada will ever forget it. But we live in a crazy world today, with one half of it urgently needing wheat and meat, and the other half getting increasingly worried as to whether they can sell what they are producing. There is nothing new in the idea that we must pay for food with manufactured goods and services. We have always had to do so in the long run. But through fear and lack of confidence we've got our natural lines of communication tangled up almost beyond understanding. I wonder if any of you are familiar with Hilaire Belloc's "Cautionary Tales for Children", because there is one relating to a certain Henry King* which seems to me to describe the present situation pretty aptly. It runs generally like this:

The chief defect of Henry King
Was chewing little bits of string.
At last he swallowed some which tied
Itself in ugly knots inside.
Physicians of the utmost fame
Were called at once — but when they came
They all said as they took their fees—
"There is no cure for this disease—
Henry will very soon be dead."

Ladies and gentlemen, dollars like string should be used for tying things together. They should not be allowed to get so tangled up inside that economists can find no cure for the disease. You and I and all the ordinary people of the world are the unfortunate Henry King, and if we don't do something about it we shall come to an equally unhappy end.

Canada's Important Part

Money, of course, is not by any means the only difficulty that has to be straightened out among the peoples of the world, and when I see the way in which we seem to be grouping ourselves into two vast armed camps, I am reminded of yet another story.

It concerns a public enquiry which was being made into the causes of a railway accident. The court brought the signalman to the witness stand and asked him to tell in his own words exactly what had happened. So far as he was concerned, he started something like this, "Well, sir, at 8.45 a.m. on the day of the accident, I put my head out of the window of my cabin and looked to the north where I saw the down express approaching at approximately 60 miles an hour". "Yes, go on," said the court. "Well sir, I then turned round and looked to the south, and then I saw the up express approaching also at 60 miles an hour on the same line". "Yes! Yes! go on," said the court. "What action did you take?" "Well sir, I withdrew my head from the window and I turns to my mate and I says to him, Bill I says, that's a bloody funny way to run a railway!"

Ladies and gentlemen, to have two vast groups of nominally civilized peoples rushing as it seems headlong towards conflict is, if you will forgive me the word, a bloody funny way to run a world. I am not nearly wise enough to suggest what should be done, but in whatever can be done I feel that Canada, because of her origins, her history, her situation, and her resources has a tremendously important part to play. I stress again the importance of food because wherever people are hungry there will the seeds of conflict be sown. And although Canada is on the threshold of almost limitless mineral and industrial developments, we in the old world, pray that her farming will never be neglected. We pray, too, that her new resources may be developed more rationally than has been done elsewhere. When I said in my opening remarks, that I must be addressing distinguished engineers, I was not just indulging in empty compliments. There is indeed every reason why Canada should produce the greatest engineers in the world. For alongside all the vigour and resourcefulness that come from pioneering a vast new Dominion your people spring from the stock that produced Mme. Curie, James Watt, Lord Rutherford and a host of other pioneers of science including those who originated such recent developments as radar and jet propulsion. As I understand it an engineer is one who contrives to apply the results of scientific discovery for the benefit of humanity. Your breeding and your environment are such that you can hardly help being *good* engineers, and if you can be wise engineers as well, the future of the world may yet be happier than the past.

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Notes on Management

Management at Quebec

The first Western Hemisphere Regional Conference of CIOS at Quebec in connection with the Annual Meeting of the Institute was an unqualified success.

One of its accomplishments — the most important perhaps—was to clarify in the minds of those interested in scientific management in Canada, the positions of the numerous management groups in the international picture.

For the benefit of those who were unable to be at Quebec, there is reproduced on this page the organization chart of the International Committee of Scientific Management which was displayed during the Quebec Conference. The International Committee, known as CIOS (from the French — Comité International de l'Organisation Scientifique) is an international clearing house for management information and experience developed throughout the world. Since its founding in Prague in 1924, it has sponsored eight international management congresses, held in as many world capitals, at which problems of broad interest to top management, as well as technical subjects, have been discussed.

There are currently 16 member countries, as shown on the chart. Each of these countries is represented by a single National Committee (or Council) which, in turn, must represent a suitable number of organizations in that country which devote themselves, in part at least, to the development of the art, science, and techniques of management. Thus the Canadian Management Council, of which Mr. C. A. Peachey, M.E.I.C. is chairman, is the Canadian component of CIOS and includes in turn in its membership, representatives of the foremost Canadian organizations which profess an interest in scientific management.

Currently the president of CIOS is Mr. Assar Gabrielsson, a leading industrialist with the Volvo Company, automobile manufacturers of Stockholm. H. B. Maynard, prominent American management consultant, is chairman of the National Management Council of the United States.

CIOS holds its International Congresses at three year intervals and supplements them with smaller regional conferences and the Quebec Hemisphere Conference of the Canadian, American, and Brazilian Councils was the first attempt at such a regional meeting. The Canadian Management Council, having only been admitted to CIOS membership in 1947, is deserving of the highest praise for its initiative in organizing and carrying the conference to its very successful conclusion.

The opening session on Friday morning brought together on the platform Mr. C. A. Peachey, Mr. H. B. Maynard who gave the keynote address, Dr. M. E. Alvaro of Sao Paulo, Brazil, president of IDORT, the Brazilian Institute of Scientific Management, and Dr. Hugo de Haan, secretary-general of CIOS from Geneva. Dr. de Haan brought greetings from CIOS in Europe and from the president in Stockholm.

At the later morning session Dr. Alvaro read a very interesting paper "Planning and Unified Management of Industrial Apprenticeship in Brazil", prepared by a member of IDORT. The paper described the methods of approach to the problems connected with apprenticeship as they present themselves in Brazil.

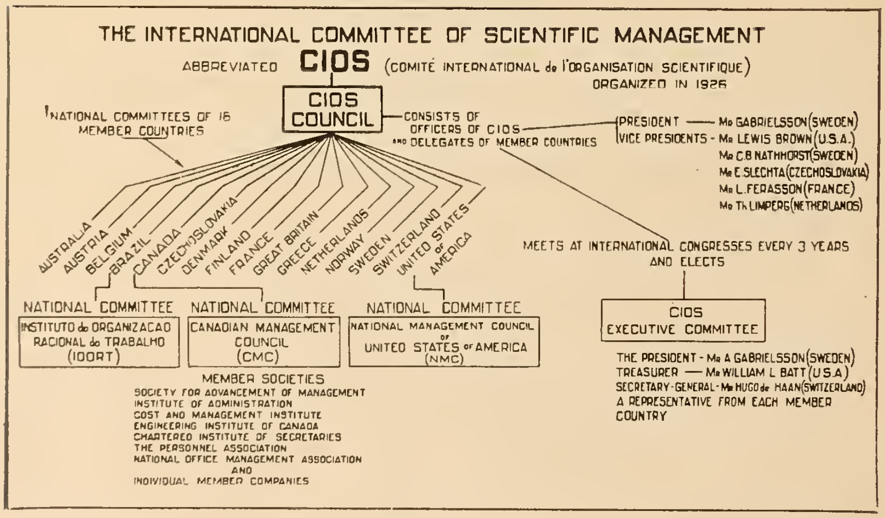
All management sessions on Friday were well attended and the noon luncheon meeting, addressed by Dr. Lillian Gilbreth, was nothing less than marvelous. After an effective introduction by Miss Elsie MacGill, aeronautical engineering consultant of Toronto, Dr. Gilbreth speedily captured her audience and held them spellbound to the end, as she spoke without a note on "The Place of Human Engineering in Management". She received a tremendous ovation at the close of her address.

The afternoon panel discussion "Management — a Trusteeship" with Dr. J. M. Juran of New York University as moderator, brought together two experienced industrialists from Canada and two from the United States. While they did not attempt to settle the problems connected with this aspect of industry they did expose all sides of it and provoked some interesting questions from the audience.

A large number of Institute members remained for the conference on Saturday and there was an attendance of about 150 at that luncheon.

On Saturday morning Dr. Alvaro read another paper dealing with the training of young people for positions in business in Brazil. Again one was impressed with the fundamental oneness of business problems, modified by local circumstances and conditions.

Mr. James L. Madden gave a very inclusive paper "Coordination — an Essential Function of Modern Management". His illustrations were drawn from his experience as vice-president of the Metropolitan Life Insurance Company. Some difficulty will



probably be experienced in trying to adapt these methods to smaller scale operations.

At the noon luncheon, Professor E. H. Schell of Massachusetts Institute of Technology gave an excellent address "Current Managerial Trends and Opportunities". Dr. Schell has a tremendous circle of graduates and business associates on whose experience he can and does draw. As a result his addresses always abound with up-to-date information. He received a splendid reception and one hearer said it was the highlight of the Conference.

The afternoon panel discussion "Management Policies in a Post Boom Period" with Mr. Elliott M. Little, M.E.I.C. as Moderator, brought together another binational panel. There was not entire unanimity on all aspects of this subject, but the salient features and economic factors were exposed and discussed. Some interesting questions also came from the floor.

The chairman of the Canadian Management Council brought the Conference to a close with appropriate words of thanks to all who had participated and contributed to its effectiveness.

Everywhere the opinion was expressed that the Conference was a success and the retiring president of the Engineering Institute remarked that he thought we had started something worth while. Those responsible for the Conference have reason to feel gratified by the results of their first effort. Mr. C. A. Peachey put a vast amount of effort into its preparation and his energy and drive were largely responsible for the success achieved. Mr. J. Edgar Dion, M.E.I.C., also contributed to the success of the programme by his consistent follow-up.

The next question is: Where do we go from here? The answer will be different as one views it from the standpoint of the E.I.C. or the Canadian Management Council.

From the E.I.C. standpoint, the attendance at and interest in the Management Conference on the part of the members indicates that the conference filled a real need. The Montreal Branch of the Institute has a special section on Industrial Engineering and Management and has one or two meetings of its annual programme devoted to this subject. Possibly this type of activity could apply to other Branches of the Institute. The A.S.M.E. has had a successful Management Section since the days of F. W. Taylor, one of the pioneering engineers in the field of scientific management. Certainly it would seem desirable for the E.I.C. to devote some time to management subjects at subsequent annual meetings, possibly jointly with the C.M.C. The panel type of discussion seemed particularly appropriate.

The C.M.C. must go forward with a programme which will enable it to become truly National, and to ensure that all professional bodies interested in Management are affiliated as soon as possible with the National Organization. It is of interest to note that all of the major countries supporting the North-Atlantic Pact are members of CIOS. It is logical that these same countries which are already banded together by a mutual defence pact, should collaborate at an international level to discuss common problems of Management.

It is expected that all of the management papers can be included in a single issue of the *Journal*. At this writing it appears that the October issue will be used.

EMERGENCY RAILWAY BRIDGING

(Continued from page 411)

The girders were 89 ft. 6 in. long, 9 ft. 2 in. overall in depth and weighed $26\frac{1}{2}$ tons. Due to the skew, the centre of gravity of the approach span was 14 in. beyond the maximum boom length, but by drifting the girder hooks approximately 13 in, this was partially overcome, reducing the off centre unbalance to about 600 lbs., which was offset by placing a balancing load on the shore end. Again, the remaining clearance between the portal bracing of the truss span and the top of the rail when handling a girder 9 ft. 2 in. deep, with "two blocks" on the load falls, was only 10 in. The boom tip was raised 16 in. higher than the portal bracing and proved, under full load of the girder, to have lowered 18 in, thus giving 2 in. clearance under the portal with the underside of the girder 8 in. clear of the rails.

During removal of the span by the Dominion Bridge Co.'s crew, C.N.R. bridge crews erected six bents of temporary trestle under most adverse water conditions and were preparing to bridge the remains of pier No. 4 which is also the site of the new pier. The first train passed over the improvised crossing on August 19th at 2.40 P.M.

Concrete piers No. 4 and No. 5, lost during the flood, have now been replaced by C.N.R. bridging crews using steel H pile towers with maximum penetration of 35 ft.

Each pile pier consists of 39 pieces of 12 in. H at 65 lbs. ranging from 60 to 80 feet in length. They were placed by Dominion Loco Cranes and driven by an Industrial Brown Hoist track driver with a No. "O" Double Acting Union hammer of 13,400 lbs. weight, exerting a 19,150 ft. lb. blow at 110 blows per min. Piling is capped with 15 in. channel at 33.9 lbs. 41 ft. 6 in. long. Bracing and girts of $5 \times 3\frac{1}{2} \times \frac{3}{8}$ angles were all welded in place in the field. Grillages were built up of 15 in. I at 42.9 lbs. and covered with $\frac{3}{4}$ in. bed plates to carry the original pier members (Fig. 8).

Procedure on erection of the permanent structure is to load the salvaged girders on a flat car, use two locomotive cranes to place the girders on either side of the existing track and then to fill in the floor system in progressive stages and fully rivet.

A similar procedure is planned for spans No. 4 and No. 5 except that the spans will be completely assembled on tracked carriages on the downstream side of the bridge and rolled into position at a time suitable to train schedules, with a maximum allowed time between trains of seven hours. Should the present rate of progress be maintained, the permanent structure will be completed by mid March, 1949.

General Conclusion

It is interesting to note that during the flood period of 1948, the only means of travel to many key points previously serviced by rail or road was by air, which increased the problem of distribution of men and equipment. Although all these projects were hurriedly planned and executed under emergency conditions, with a limited amount of equipment, they all worked out as originally conceived and no major changes in plans were necessary during the operations.

FROM MONTH TO MONTH

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Aeronautical Co-operation

On Friday, June 10th, President Armstrong was host at a luncheon at the University Club of Montreal to a distinguished delegation from the Royal Aeronautical Society of Great Britain. The visitors included the Society's president, Sir John Buchanan, secretary, Captain J. Lawrence Pritchard, technical director, Dr. D. M. A. Leggett and solicitor, L. A. Wingfield.

Other guests included past-presidents and officers of the Institute and the Montreal branch, together with a number of officials of aeronautical organizations in Montreal.

The meeting was strictly informal although the visitors responded to the president's request to address a few words to the audience. Sir John Buchanan made brief reference to the operations and policies of the Society and said that he and his party were endeavouring, in visits to Toronto, Ottawa, and Montreal to determine the feasibility of establishing a Canadian Division. Captain Pritchard further stated the belief of his Council that the Royal Aeronautical Society could be of use to aeronautical engineers in Canada.

The general secretary of the Institute was called upon to speak and he expressed the belief of the Council of the Institute that the most effective solution would be a revival of the co-operative agreement which had existed between the two societies before the war and had functioned so well in Ottawa. He felt that any new agreement should include the Institute of the Aeronautical Sciences (U.S.A.) which already has a considerable membership in Canada.

Following the luncheon the British visitors met with Dr. Wright at Headquarters where there was further discussion of the proposed agreement.

On Saturday, the party left for Ottawa, where they visited with members of the Royal Aeronautical Society to discuss the best way by which the interests of aeronautical engineers in Canada may be served. They returned to England during the week following stating their intention of recommending the proposed three-way agreement to the Council of the Royal Aeronautical Society.

Presidents of the Royal Aeronautical Society and the Engineering Institute, Sir John Buchanan and Mr. J. E. Armstrong.

Progress Report on ECPD Activities

At a meeting of the Executive Committee of the Engineers' Council for Professional Development on May 23, 1949, H. T. Heald, president of Illinois Institute of Technology and chairman of the Committee on Engineering Schools of the ECPD, announced that 106 engineering colleges have been visited by inspection committees during the past two years. A total of 481 curricula have been inspected, including 112 new curricular inspections. It is anticipated that by the end of the inspection year, a large share of the previously accredited curricula will have been reviewed and virtually all new curricula for which inspection has been requested will have been examined.

The Committee on Engineering Schools is also studying the accreditation of graduate work in engineering. It is also attempting to develop better procedures for handling specialized engineering curricula.

The Committee on Professional Development, headed by A. C. Monteith, vice president of Westinghouse Electric Corporation, is embarking upon a seven-point programme, focusing attention upon improving the professional training in the post-graduation years. This programme includes:

(a) a comprehensive survey of post-graduate programmes in engineering colleges, industry, the government, and engineering societies;

(b) a study of methods of developing community-level programmes aimed at improving the professional status and training of the engineer;

(c) an analysis of the professional registration of engineers;

(d) the encouragement of personal appraisal of the engineer in relation to his job, his community, and the engineering profession;

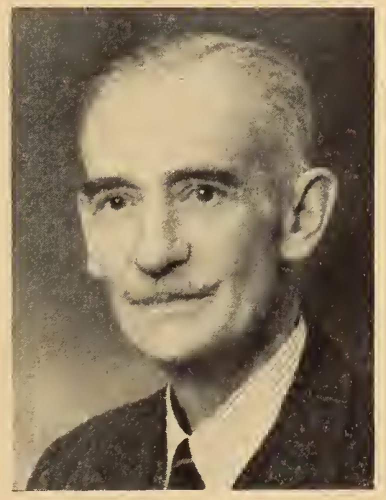
(e) a study of orientation and training programmes in industry, with a view toward disseminating information along this line which will aid both large and small companies in developing suitable programmes;

(f) the revision of selected bibliographies of engineering subjects; and

(g) the preparation of a selected reading list for young engineers. The latter two projects are nearing completion.

The Passing of an Era

It is probably safe to say that every engineering graduate of the University of Manitoba who reads these notes will agree with this title. It has been announced recently that E. P. Fetherstonhaugh, Manitoba's Dean of Engineering and Architecture will retire on August 31st, the end of the present university year.



E. P. Fetherstonhaugh, M.E.I.C.

Dean Fetherstonhaugh was appointed to the chair of electrical engineering at Manitoba when it was first established in 1909 and assumed the position from which he now retires when separate faculties were established in 1921. He has taught electrical engineering to every electrical graduate of Manitoba and although the civil engineering students have not always had him as a teacher they have come to know him well around the engineering building on Manitoba's Fort Garry campus.

His strong character has been a helpful factor in the lives of all his students, and his administrative ability the principal influence in the successful development of the engineering faculty.

He was elected president of the Institute in 1945 and his distinguished career was set forth in detail on page 122 of the *Journal* for February of that year. To the distinctions listed at that time he has since added the honourary degrees of D.Sc. (McGill 1945); LL.D. (Manitoba 1947); and the Julian C. Smith Medal of the Institute in 1945.

Dean Fetherstonhaugh will be succeeded by Professor A. E. MacDonald, M.E.I.C., who has been chairman of the department of Civil Engineering, Professor W. F. Riddell, M.E.I.C., will assume the post vacated by Professor MacDonald. These appointments are dealt with in greater detail in the personals section of this *Journal* (see page 424).

Britain's Export Drive

The Right Honourable Harold Wilson, president of the U.K. Board of Trade, was interviewed, recently, by the press in Montreal. A representative of the *Journal* was present.

Questioned on the possibility of devaluation of sterling, Mr. Wilson quoted the British Chancellor of the Exchequer and said "It is not desirable nor shall it take place". Asked what measures have been taken to overcome high British export prices, Mr. Wilson contended that the prices of British exports have risen less than the prices of imported raw materials required for the fabrication of export goods.

Asked if the U.K. Government would consider the easing of monetary controls to permit the promotion of British goods in Canada, Mr. Wilson replied "Yes, no reasonable offer will be refused".

It was Mr. Wilson's opinion that Britain is entering a period of very acute economic situations, and that drastic steps will have to be taken to overcome these — greater exports will be necessary, particularly in view of the fact that U.K. production is now 40 per cent above 1935.

Mr. Wilson stated that the most important single discovery he made during his journey across the Dominion is the very small percentage of British engineering products in use, or being purchased in Canada.

Commenting on this statement later in an address before the Rotary Club of Montreal, Mr. Wilson said, "I have every confidence that we shall see a reasonable further increase in the export of consumer goods from the U.K. to Canada, even in these buyers' market conditions, but I feel that it is the engineering industries, in the provision of capital equipment and heavy plant and machinery that we may hope for the biggest expansion of British exports in this market. We have been impressed as we have travelled through Canada, not only with the size of your market, not only with the prosperity of your market, but with the enormous programmes of capital development schemes that are planned for the next few years: Oil and hydro development, mining, irrigation, and drainage ".

Sarnia Engineers and the Election

No one can accuse the engineers in Sarnia, Ontario, of not taking an interest in Canadian politics. They had some questions they wanted answered, so they invited to a meeting all the candidates for election in the Federal riding of Lambton West—and they all came (see Branch News Section Page 428). It was the first and only time they all appeared on one platform together.

The questions related to the candidates' opinion on the following three matters—all of them of current interest to engineers, (a), the restoration of the protective tariff on engineering drawings coming into Canada (removed in 1946), (b) the appointment of an engineer to the Canadian section of the International Joint Commission and, (c) the entry into Canada of engineers from other countries.

The candidates were pretty much in agreement, although the newspaper account from which this is being written indicates a certain amount of confusion in their minds —or the mind of the reporter. One candidate was emphatic on all three. He thought there should be an adequate tariff against plans made elsewhere: that " the International Commission is an engineering problem and there should be at least two engineers on it—and it is up to you people to see that they are appointed ": that " in regard to engineers coming into Canada I claim that if you fellows can't do the job, then bring in someone who can ". Hear, hear, say we all!

Another candidate thought the questions were " political dynamite ", but he agreed with the answers just given. A third candidate went so far as to state that " an appointment of an engineer to the International Commission was in the offing ". Let's hope he knows what he is talking about.

It's nice to know that at least four candidates support the engineers' case. If only all four could be elected they might form an active unit to speak for the engineers in the House of Commons. From the progress made to date on these problems it is apparent that up to now there has been no such interested group at Ottawa.

Congratulations to the Sarnia Branch! Here is a bright idea that could have been used right across Canada if it had been discovered earlier. Let us not forget it next time.

Technical Papers

Members are reminded again that Technical Paper No. 1 (by R. DeL. French, and F. M. Wood) is available from Headquarters. The price is $1.50, cash with order.

This paper is called, " Flow in Conduits and Canals ", and contains fifteen charts designed to facilitate calculations of hydraulic discharge and velocity. It is authoritative and should be of value to all hydraulic engineers.

The charts are:

(1) Hazen & Williams' formula;
(2) Correlation of C and *n*;
(3) Transformation factors for sections other than circular;
(4) Markmann formula for loss of head on curves;
(6-15) Hydraulic elements of common sections.

The paper also includes tables of logarithms to help in the solution of the Hazen & Williams' formula for cases not covered by the charts.

If your work includes the design of sewers, large pipe lines, penstocks, canals, flumes, drainage ditches, and the like, you will find that this paper will save you time.

Correspondence

May 27th, 1949.

Dr. L. Austin Wright:

I am pleased to report having attended the recent meeting of the Dominion Fire Prevention Association of Canadian Fire Marshals.

I attended several of their sessions and was officially recognized as the representative of the Institute.

They had a most successful gathering with a full programme of important papers, many of which dealt with subjects closely related with our profession, and I consider it is an Association that warrants contact being maintained as few of us appear to appreciate our opportunity of eliminating fire hazards.

The privilege of representing the Institute was duly appreciated, and I submit this brief report for your records.

Yours very truly,

D. A. R. McCannell, M.E.I.C.
City Engineer,
Regina, Sask.

May 31st, 1949.

Dr. L. A. Wright:

As chairman of the fourth Annual Conference of Engineering Undergraduate Societies sponsored by the Engineering Institute of Canada, held at Chateau Frontenac, Quebec City, May 10th to 13th, 1949, I have been authorized to extend to you and your staff our warmest appreciation for the special interest taken in the welfare of the student delegates at the conference.

We have enjoyed the keen interest shown in our problems by the Engineering Institute of Canada and by each of the delegates we were privileged to meet both officially and socially.

By bringing together the leaders in Engineering undergraduate activities under the aegis of the Engineering Institute of Canada, we feel that you have not only done us a great honour but have greatly increased our knowledge of how to tackle our mutual problems.

You may be assured that our experiences at the Engineering Institute of Canada Conference in Quebec City have become an integral part of our thinking and will influence us greatly in the years to come.

Thanking you again, for making us now fully aware of our future professional obligations.

CLAUDE E. HOWARD, S.E.I.C.
President,
Engineering Undergraduate Society
McGill University,
Montreal.

After the publication of the note on Samuel Fortier, Pioneer in Soil Mechanics, (February issue, 1949), Mr. J. G. G. Kerry, M.E.I.C., *of Port Hope, Ontario, wrote to the author, R. F. Leggett,* M.E.I.C., *to amplify the Journal article as follows. Ed.*

" This is to thank you for your kindly notice of my old college contemporary Sam Fortier which appears in the current number of the *Engineering Journal.*

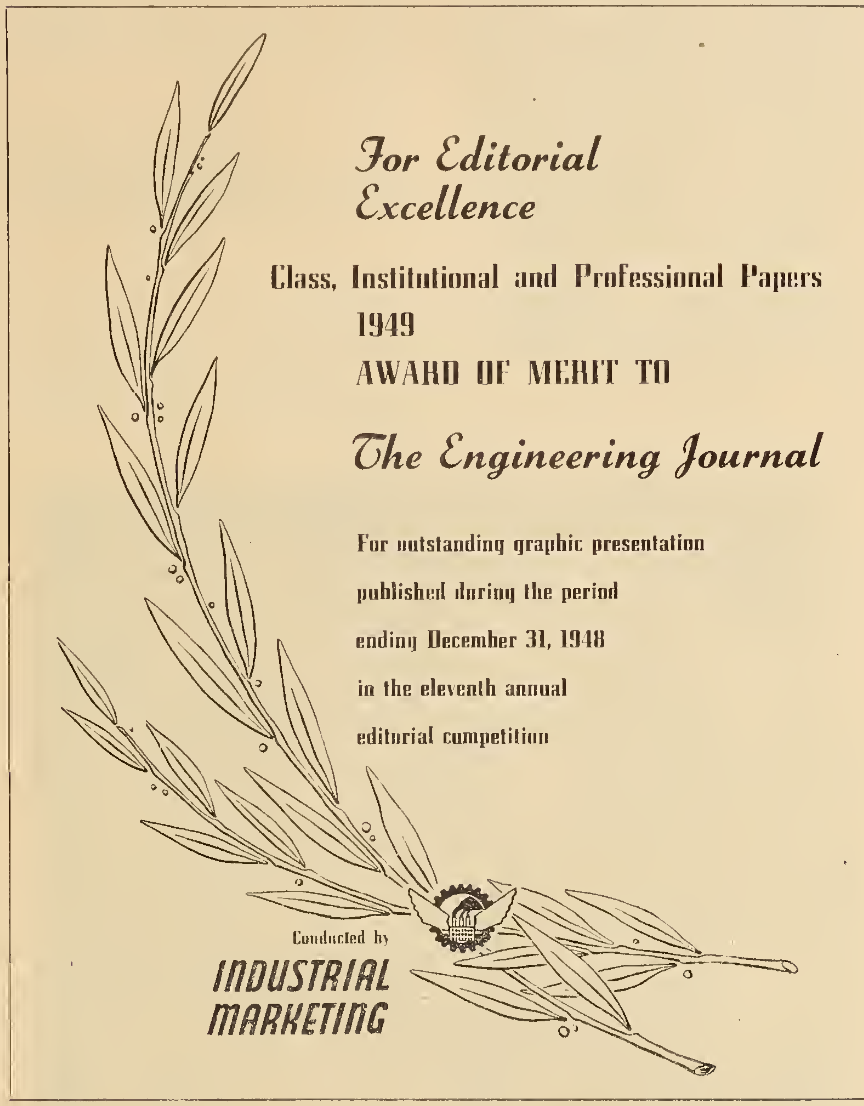
" I remember him chiefly as the anchorman in our tug-of-war team in which he teamed up with such engineering stalwarts as Jack Hislap who built the White Pass and Yukon River Railway, Mackenzie who made his mark in the Andes, Trenholme who was content to be a manufacturer in Montreal and Cecil B. Smith who roamed Canada seeking and creating new enterprises. That group was short in number but very long on brawn and brains.

" Fortier was just as you have described him, kindly, thoughtful, considerate and much more mature than most of his fellow students. I missed a chance once of joining him at Ogden because I was lost in the wilds of Gaspe on a railway survey when he wrote. I saw him in after years in his office at Washington; looking for him reminded me of looking for a needle in a haystack so vast were the offices of the Department."

The *Journal* Wins High Editorial Award

On June fifteenth at Buffalo, N.Y., our publications manager received, on behalf of the Institute, the original of the certificate which is reproduced on this page, presented to *The Engineering Journal,* for the best graphic presentation appropriate to the publication's function ".

The presentation which merited



For Editorial Excellence

Class, Institutional and Professional Papers
1949
AWARD OF MERIT TO

The Engineering Journal

For outstanding graphic presentation
published during the period
ending December 31, 1948
in the eleventh annual
editorial competition

Conducted by
INDUSTRIAL MARKETING

The *Journal* was one of six hundred Canadian and U.S. publications entered in the eleventh annual editorial contest which is sponsored by *Industrial Marketing*—the publication which serves the members of the industrial publishing and advertising fraternities. Only two Canadian publications received awards *Industrial Canada,* and *The Engineering Journal.*

The citation read at the presentation stated: " Award of merit, the award was of the paper " The Engineering Phases of Oil Production " by E. D. Wilson of Imperial Oil Limited. It was published in the August 1948 issue of the *Journal.* Mr. Wilson presented his paper at the 62nd Annual Meeting of the Institute at Banff in June 1948.

The original certificate has been placed in the foyer of Institute Headquarters and a duplicate has been forwarded to Mr. Wilson.

News of Other Societies

The 20th Annual Meeting of the **Canadian Chamber of Commerce** (Board of Trade Building, Montreal 1) is arranged to take place at the Chateau Laurier, Ottawa, Ont., on October 25-27, 1949.

The **Illuminating Engineering Society** (51 Madison Avenue, New York 10, N.Y.) advises of the inauguration of the Maritime Chapter of the Society. The charter meeting was in Saint John, N.B., on May 30th last, when D. Roland Webb, M.E.I.C., was elected chairman of the new chapter.

The next annual meeting of the **Canadian Construction Association** will be in January 1950, at the Mount Royal Hotel, in Montreal.

The **Community Planning Association of Canada** (56 Lyon St., Ottawa, Ont.) has announced that the National Citizens' Conference on Community Planning will take place at the Fort Garry Hotel Winnipeg, Man., October 6-8, 1949.

The Montreal regional conference of the **American Institute of Chemical Engineers,** September 7, 8 and 9, 1949, will devote two days to technical papers. Plant visits to several industries at Shawinigan Falls, Que., have also been arranged.

The annual meeting of A.I.Ch.E. for 1949 will be at Pittsburgh, Pa., at the William Penn Hotel, December 4-7.

The fall meeting of the **American Society of Mechanical Engineers** (29 West 39th St., New York 18, N.Y.) is scheduled for September 28-30, at Erie, Pa.

The Society's annual meeting will be in New York, November 27 to December 2, 1949.

The Pacific general meeting of the **American Institute of Electrical Engineers** (33 West 39th St., New York 18, N.Y.) will take place at the Fairmount Hotel, San Francisco, Cal., August 23-26. The mid-west general meeting will be at the Netherland Plaza Hotel, Cincinnati, Ohio, October 17-21.

The west coast meeting of the **Society of Automotive Engineers** will be held August 15-17, at the Multnomah Hotel, Portland, Ore.

Inquiries should be addressed to S.A.E. at 29 West 39th St., New York 18, N.Y.

The 1949 Engineering and Marine Exhibition, at Olympia, London, England, August 25 to September 10, 1949, will be the seventeenth exhibition in the series instituted in 1906. Over 600 exhibitors will be represented.

For the Second International Mechanical Engineering Congress, September, 1949, Paris, France, has been chosen as the locale.

Theme of the Congress will be "Production Efficiency."

The Congress Secretariat is at 11, Avenue, Hoche, Paris (VIII^{e}).

La Société de Chimie Industrielle, 28 rue Saint-Dominique, Paris VII^{e}, France, advises of plans for the 22nd International Industrial Chemistry Congress at Barcelona, Spain, on October 23-30, 1949.

Active Army officers who attended the Annual Meeting at Quebec in May, were: Front row: Major R. H. Hodgson, M.E.I.C., R.C.E.M.E.; Capt. Guy Lefebvre, S.E.I.C., R.C.A.; Maj.-Gen. N. E. Rodger, C.B.E., M.E.I.C.; Lt.-Col. M. C. S. Brown, D.S.O., M.E.I.C., R.C.E.; Centre row: Capt. C. R. Baker, M.C., S.E.I.C., R.C.A.; Capt. P. Martel, M.E.I.C., R.C.A.; Maj. P. J. Paterson, R.C.A.; Lt.-Col. T. R. Gemmell, M.C., R.C.A.; Back row: Lt.-Col. D. W. Cunnington, R.C.E.; Capt. J. W. MacNaughton, M.E.I.C., R.C.A.

Personals

Notes of the Personal Activities of Members of the Institute

A. W. Whitaker, Jr., M.E.I.C., treasurer of the Institute for 1949-50, is vice-president and general manager of Aluminum Company of Canada Limited, Montreal.

Mr. Whitaker is a chemical engineering graduate of the University of Pennsylvania. He joined the Aluminum Company in 1913 as a research engineer at the Niagara Falls plant. He was transferred to Arvida, Que., in 1926 and was named works manager. In 1939 he was appointed chief engineer of the Company. In 1940 as general manager, he combined his new duties with those of chief engineer. It was in 1943 that

Blank & Stoller Photo

A. W. Whitaker, M.E.I.C.

he received his appointment as vice-president and general manager of the Company.

Mr. Whitaker is a member of the Electrochemical Society, the Canadian Manufacturers Association and the Montreal Board of Trade.

H. B. Bowen, M.E.I.C., of Montreal, chief of motive power and rolling stock for the Canadian Pacific Railway since 1928, retired in May after 44 years of service with the Railway. **W. A. Newman,** M.E.I.C., of Montreal, who will succeed Mr. Bowen, has been manager of the Railway's department of research since its formation in 1945. Mr. Newman will remain in charge of the research department, with **F. V. Stone,** of Montreal, assuming wider responsibilities on his promotion as assistant manager of the department.

Both Mr. Bowen and Mr. Newman were awarded the C.B.E. for their World War II production efforts. Under Mr. Bowen's direction the C.P.R.'s huge machine shops in Montreal and Calgary turned out hundreds of tanks and marine engines and other classes of ordnance that represented a contract value of more that $135,000,000. Mr. Newman was president and general manager of Federal Aircraft Ltd., a crown company, from 1940 to 1944, when he was placed in charge of the entire Canadian aircraft industry as aircraft controller in the Department of Munitions and Supply.

A native of Derbyshire, England, and educated in railway machine work at the Manchester School of Technology, Mr.

H. B. Bowen, M.E.I.C.

Bowen first came to Canada in 1905, joining the C.P.R. in Montreal and moving to Winnipeg less than a year later where he rose rapidly, until his return here as head of the mechanical department. Mr. Bowen's long experience in devising better production methods in his department was a main factor in the speed with which C.P.R. shops geared for war.

Mr. Newman also has had wide experience in the mechanical department since first joining the company in 1911, and was chief mechanical engineer when he went on loan to the government in 1940.

He was educated at Queen's University, Kingston, Ont., graduating with a B.Sc. degree. He is a trustee of that university.

J. M. Breen, M.E.I.C., was appointed recently as president and general manager of Canada Cement Company, Limited, succeeding the late F. B. Kilbourn, M.E.I.C.

He has been executive vice-president

Photo from Who's Who in Canada

J. M. Breen, M.E.I.C.

and general manager of the company since early in 1948, when he was also elected a director of the Company.

Following graduation from the University of Toronto in 1921 with the degree of B.A.Sc., Mr. Breen was employed for a time with the Toronto Harbour Commission, and later with the Roads Department of the City of Toronto. In 1922 he joined the staff of the Canada Cement Company in Toronto. He was a technical engineer there until his transfer in 1934 as chief of the technical staff at Montreal. He was appointed assistant general manager in 1947.

Mr. Breen is a member of the Quebec Corporation of Professional Engineers, and of the American Concrete Institute.

General the Hon. A. G. L. McNaughton, M.E.I.C., Canadian permanent delegate to the United Nations, has accepted the appointment as honorary colonel commandant in the corps of the Royal Cana-

W. A. Newman, M.E.I.C.

dian Electrical and Mechanical Engineers.

He has been honorary colonel of the Corps since 1946, but now vacates that appointment for the senior one.

Regarded by members of the R.C.E.M.E. as one of the fathers of the corps, General McNaughton took a keen interest in mechanical equipment while commanding the 1st Canadian Army in the United Kingdom. His advice and influence were largely instrumental in bringing about formation of the R.C.E.M.E.

Dr. C. J. MacKenzie, M.E.I.C., president of the National Research Council of Canada, was the recipient of the honorary degree of doctor of science, at the recent graduation exercises of Princeton University, Princeton, N.J.

In presenting the degree, Dr. Harold W. Dodds, president of Princeton, cited the position of Dr. Mackenzie in Canada's wartime research, and the patriotic and international service he continues to give in his postwar position.

J. B. Hayes, M.E.I.C., who retired in 1948 as manager of the Nova Scotia Light and Power Company Limited, Halifax, received recently the honorary degree of doctor of engineering from the Nova Scotia Technical College. Dr. A. E. Cameron, president of the College, presented the degree.

Dr. Hayes, who in 1946 was awarded the O.B.E., was president of the Engineering Institute that year.

Dr. Louis Bourgoin, M.E.I.C., of Montreal, has been named a fellow of the Royal Society of Canada. Dr. Bourgoin is director of the Research Centre, Ecole Polytechnique, Montreal.

F. G. Goodspeed, M.E.I.C., retiring as assistant chief engineer of the Department of Public Works of Canada, Ottawa, has completed 45 years of service with the Department. He entered it as assistant engineer, after graduating from the University of New Brunswick with the degree of B.Sc. in 1904.

He was at first appointed to work on the Georgian Bay Survey and was transferred to district offices at Saint John, N.B., and Edmonton, Alta. In 1913 he returned to Saint John as district engineer on harbours and rivers. Later he became senior assistant engineer of that district, and in 1924 he was promoted to district engineer at Winnipeg. He was made superintending engineer at the Ottawa headquarters in 1937, and was named to the post of assistant chief engineer in 1947.

G. E. B. Sinclair, M.E.I.C., is president of the Professional Institute of the Civil Service of Canada for 1949-50. Mr. Sinclair, who has been prominent on the executive of the civil service Institute for the past five years, is chief of the Lands Division of the Department of Mines and Resources, Ottawa.

H. W. Welsh, M.E.I.C., of MacKinnon Structural Steel Limited, Sherbrooke, Que., was elected president of the Canadian Institute of Steel Construction, at the recent Annual Meeting of the Institute in Montreal.

Other officers elected were: **Frank P. Flett,** M.E.I.C., Truscon Steel Company of Canada, Ltd., Toronto, first vice-president; and **George H. Midgley,** M.E.I.C., Dominion Bridge Company, Ltd., Lachine, second vice-president.

Nicol MacNicol, M.E.I.C., works commissioner of Forest Hill Village, Ont., was elected chairman of the Canadian Section of the American Water Works Association at the recent Annual Meeting at Quebec City.

Trustees of the Section, also elected at the meeting, were **C. G. R. Armstrong,** M.E.I.C., consulting engineer of Windsor, Ont.; and **J. W. D. Farrell,** M.E.I.C., superintendent of Waterworks, City of Regina, Sask.

S. G. Coultis, M.E.I.C., has been named vice-president and general manager of Imperial Pipe Line Company, a subsidiary of Imperial Oil Ltd.

Associated with Southern Alberta's oil industry for many years, he has been since 1939 president and general manager of the Valley Pipe Line Company at Calgary. A past-vice-president of the Institute, Mr. Coultis has been active in the affairs of the Calgary Branch.

A. E. Macdonald, M.E.I.C., who for the past 13 years has been head of the department of civil engineering at the University of Manitoba, will be the new dean of the Faculty of Engineering and Architecture, succeeding Dean E. P. Fetherstonhaugh who retires on the 31st of August.

A. E. Macdonald, M.E.I.C.

Born in Halifax, Nova Scotia, in 1900, Professor Macdonald attended Dalhousie University and the Nova Scotia Technical College, where he received the degree of B.Sc. in Civil engineering in 1920; and he subsequently graduated from McGill University with the degree of M.Sc. in 1922, having specialized in structural engineering.

During World War II he was retained as supervising engineer by the steel controller's branch, Ottawa, on steel plant expansion programmes of the Dominion Steel and Coal Corporation, Sydney, N.S.; The Steel Co. of Canada, and Dominion Foundries and Steel Co., Hamilton; Algoma Steel Corporation, Sault Ste. Marie; and Wm. Kennedy & Sons, Owen Sound.

Professor Macdonald's teaching experience has included appointments at Dalhousie University 1918-20; as lecturer in civil engineering at the University of Alberta 1920-21; and as assistant professor 1923-30, associate professor 1930-36, and professor and head of the department of civil engineering of the University of Manitoba since 1936. For five years he worked in the summers with C. D. Howe and Co., Port Arthur, Ont on the design and construction of grain elevators including the 7,000,000 bushel elevator for Saskatchewan Pool Terminal No. 7; a 5,500,000-bushel United Grain Growers Terminal Elevator, and Bawlf and Stewart terminals of 2,000,000 bushels each. As a consultant he has designed and supervised various foundation and underpinning projects as well as structures of reinforced concrete and steel in Winnipeg.

Professor Macdonald is a member of The Association of Professional Engineers of Manitoba, The American Society for Testing Materials, The American Concrete Institute, and the American Society for Metals. He has contributed many articles to technical publications including such subjects as foundations in Winnipeg, dust explosions, grains elevator design and construction.

W. F. Riddell, M.E.I.C.

Professor W. F. Riddell, M.E.I.C., who has been a member of the teaching staff of the civil engineering department of the University of Manitoba since 1925, will succeed Professor A. E. Macdonald as chairman of the department on the 1st of September, 1949.

Professor Riddell received his early education at Dauphin, Man., and left his studies in 1916 to join the 196th Universities Battalion from which he was transferred to the 46th Battalion and remained in the army until the end of World War I.

Entering the Manitoba's civil engineering course as a student after the war he graduated in 1924 with the degree of B.Sc. in civil engineering and was the winner of the University Gold Medal and the Joseph Doupe Gold Medal in his final year. Later he proceeded with graduate studies at the Universities of Michigan and Manitoba and received the degree of M.Sc. (Man.) in 1931 for advanced studies in hydraulics and structural design. He was appointed lecturer in civil engineering at the University of Manitoba in 1924, assistant professor in 1929 and associate professor in 1942.

In vacation periods Professor Riddell has been engaged in various engineering activities:—with the C.P.R. on construction; The Dominion Bridge Co. Ltd., on structural design; the Backus Paper Co. and the Manitoba Power Company. For three years he commanded the University of Manitoba C.O.T.C. with the rank of lieutenant colonel and during World War II he served for two summers as camp egineer officer at Shilo Camp, Man. For four summers he was engaged on geodetic and topographical surveys for the Dominion Department of Mines and Resources in Labrador, Newfoundland, Manitoba and Saskatchewan and for two summers on power and topographic surveys.

T. W. Dalkin, M.E.I.C.

T. W. Dalkin, M.E.I.C., director of the Technical Division, Department of Lands and Forests, Alberta, has been elected chairman of the Edmonton Branch of the Institute.

Mr. Dalkin is from Durham, England, where he studied at Darlington, Technical College and served an apprenticeship. He worked in London with Adamsez Limited, sanitary engineers, and he came to Edmonton, Canada, in 1911, and was employed first by Rowland Lines, architect. That year he joined the Alberta Provincial Government, Land Titles Office, Surveys Branch. He later became head of that branch.

In 1920-22 he worked for Driscoll and Knight, surveyors and engineers, Edmonton, after which he joined the Department of Mines, Ottawa. He returned to his previous position in 1924 and did drainage work, chiefly, until 1925, when he joined the surveys branch of the Alberta Department of Public Works. He transferred to the provincial Department of Lands and Mines in 1930, as superintendent of the Technical Division in the administration of natural resources.

S. E. Williams, M.E.I.C., resident manager of the St. Lawrence Paper Mills, Three Rivers, Que., has been elected chairman of the St. Maurice Valley Branch of the Institute.

He attended public schools and Harbord Collegiate in Toronto and obtained his matriculation, then spent some time in Northern Ontario on land survey, railway construction and bridge building. After entering the University of Toronto in forestry, he enlisted in 1914 and was overseas with the Canadian Field Artillery until the summer of 1919, when he returned to Canada. He went to work at the Belgo-Canadian

Portrait by Nakash, Montreal

S. E. Williams, M.E.I.C.

mill in Shawinigan Falls, Que., and acquired practical experience in groundwood and paper machine operation, meanwhile completing the pulp and paper machine operating course with the Institute of Industrial Arts. He was shortly appointed mill manager of the groundwood mill at Nipigon, Ont. This property was acquired by International Paper interests in 1928 and Mr. Williams was transferred to their mill at Gatineau, Que., and thence to Corner Brook, Newfoundland. Here he started as assistant groundwood superintendent, advancing to the position of general superintendent, and was finally appointed assistant manager. He resigned his position in 1938 to become resident manager of Lake St. John Power and Paper Company Limited, which he left later to accept his present position.

W. J. LeClair, M.E.I.C., secretary-manager of the Canadian Lumberman's Association, Ottawa, has been appointed to the executive of the newly formed Advisory Committee on Forest Products Research. The Committee will work closely with the Forest Products Laboratory, Ottawa, it was announced recently by the Minister of Mines and Resources, and members of the committees represent various branches of the forest products industry.

M. McMurray, M.E.I.C.

W. D. Laird, M.E.I.C., assistant general secretary of the Engineering Institute, has been elected to the town council of Baie d'Urfée, Que.

C. P. Tomlinson, M.E.I.C., has joined the Economic Cooperation Administration and has been appointed to the Mission to Italy, Rome, as chief of industry. This is the administration of the Marshall Plan and the Industry Division has under its supervision the loans made to the Italian State Railways, the oil industry, textile, hydro and thermal plants, iron and steel, paper, etc.

Mr. Tomlinson has been in Italy since early April.

J. Lorne Gray, M.E.I.C., has been named chief of administration, Atomic Energy Project, National Research Council, Chalk River, Ont. He was formerly scientific assistant to the president of the N.R.C., at Ottawa. Mr. Gray, a graduate of University of Saskatchewan (B.Eng. 1935, M.Eng. 1938), was with the R.C.A.F. during the recent war, with the rank of wing-commander.

G. L. Archambault, M.E.I.C., announces the formation of a new firm, Lachapelle & Archambault Ltd., Montreal, manufacturers' representatives in various lines of instruments and automatic controllers for industrial process, heating and air conditioning. After graduating from McGill University in 1939 as a mechanical engineer, Mr. Archambault was occupied first as sales engineer for Minneapolis Honeywell Regulator Co. Ltd. In 1941-1946 he was maintenance and sales engineer for the Aluminum Company of Canada Ltd., and in 1946-1949, sales manager of L'Hoir Aluminum & Stainless Steel Products, Levis, Que.

MacKenzie McMurray, M.E.I.C., of Dominion Bridge Company Limited, has been appointed welding engineer of the Ontario Division.

He was, until recently, boiler sales engineer in the Ontario Division. His new duties embrace supervision of all technical matters appertaining to welding in the Company's operations in Ontario.

E. J. Bartley, M.E.I.C., is now with Ford Motor Company of Canada Limited, Windsor, Ont., in the plant engineering division. Mr. Bartley was previously chief electrical engineer for Robert A. Rankin

O'Neil Photo

G. L. Archambault, M.E.I.C.

Co. Ltd., at Montreal. He is a graduate of University of Toronto in the electrical engineering class of 1941.

Dudley S. Young, M.E.I.C., has been named vice-president of Powerlite Devices Ltd., Toronto, Ont. He was for the last 4 years assistant general sales manager of Canada Wire and Cable Co. Ltd. Previously Mr. Young was for 16 years district engineer for Anaconda Wire and Cable Co., Chicago. He is chairman of the C.E.M.A. adequate wiring committee, and of the Manufacturers' Section, Canadian Transit Association. He is president of the Central Ontario Branch, University of Manitoba Engineering Alumni, and vice-president of the M.I.T. Club of Ontario.

J. W. Kerr, M.E.I.C., has been appointed to the post of manager apparatus sales, at the Hamilton head office of Canadian Westinghouse Company. In this capacity he will be responsible for sales of all apparatus products. Mr. Kerr has been with Canadian Westinghouse since graduating from the University of Toronto in 1937. In 1945, on his release from the R.C.A.F. with the rank of squadron leader, he returned to the Company in the Central Station Sales Division at Hamilton. He was named assistant manager of the division in 1947, and manager in 1948.

G. H. Gillett, M.E.I.C., has been appointed manager of the Apparatus Division of the Montreal District Office of the Canadian General Electric Company. He is responsible throughout the province of Quebec for the Company's heavy electrical equipment for utilities and industry.

Mr. Gillett graduated with a B.Sc degree from McGill University. He received the C-G-E "Test" training at Peterborough, Ont., later transferred to the Davenport Works in Toronto, and to the Company's head office. In 1928 he was transferred to Montreal Apparatus Division.

Ross H. Abbott, M.E.I.C., formerly of North American Cyanamid Niagara Falls, Ontario, has taken a new position with Eldorado Mining and Refining (1944) Limited, Port Hope, Ont.

B. H. Anderson, JR.E.I.C., is with the engineering department of Canadian Industries Limited, paint and varnish division in Toronto. Mr. Anderson is a 1947 graduate in mechanical engineering from McGill University, and has been at the University doing graduate studies until his recent appointment.

E. L. Shanas, JR.E.I.C., is in Hakirya, Israel, employed by the Ministry of Agriculture, Water Department. Mr. Shanas graduated in civil engineering from the University of Manitoba in 1947.

W. S. Gerrie, JR.E.I.C., is now with Canadian Line Materials, in Toronto, Ont. Mr. Gerrie, a 1947 graduate in mechanical engineering from the University of Toronto, was previously with Alchem Ltd., in Montreal as a sales and service engineer.

J. N. Pritchard, S.E.I.C., a 1949 graduate in civil engineering in Queen's University, Kingston, Ont., has been engaged by the city engineer's office at Ottawa, Ont., to assist in carrying out pitometer work for the waterworks department.

John A. Roney, S.E.I.C., has been employed by Canadian Comstock Co., in Scarborough, Ont. He is a 1949 graduate in mechanical engineering from the University of Saskatchewan.

Oscar A. Timm, S.E.I.C., has joined the staff of International Harvester Company at Hamilton, Ontario. He had been at Aluminum Co. of Canada Ltd., since graduating in 1948 from University of Saskatchewan.

A. H. Mallette, S.E.I.C., has been employed by the Coca Cola Company Limited in Montreal. Mr. Mallette is a 1949 graduate in mechanical engineering from McGill University.

R. T. Bailey, S.E.I.C., recently joined the staff of Margison & Babcock in Toronto. Mr. Bailey is a 1948 graduate in civil engineering from Queen's University. He has been since graduation doing municipal engineering as village engineer at Crystal Beach, Ont.

W. A. Brown, S.E.I.C., has joined Dominion Bridge Company of Canada in Lachine, Que. Mr. Brown is a 1949 graduate of McGill University in civil engineering.

H. R. Lumsden, S.E.I.C., is a resident engineer with the Nova Scotia Department of Highways and Public Works. Mr. Lumsden's duties commenced in May, 1949, after graduating in civil engineering from McGill University, Montreal.

C. G. Bickerdike, S.E.I.C., joined the staff of Shawinigan Water and Power Company, after his recent graduation in electrical engineering from McGill University, Montreal.

H. F. Pragnell, S.E.I.C., has joined the staff of The Foundation Company of Canada. His duties commenced after his recent graduation from McGill University, Montreal.

D. G. McKay, S.E.I.C., commenced work in May as an industrial engineer with Phillips Electric Works in Brockville, Ont. He is a 1949 graduate in mechanical engineering from the University of Saskatchewan.

Visitors to Headquarters

Frank B. Lee, M.I.T., Boston, Mass., May 26.

Ataliba Passos Lepage, Rio de Janeiro, Brazil, June 2, 1949.

Sir J. E. Buchanan, London, England, president of the Royal Aeronautical Society, June 10, 1949.

John Lawrence Pritchard, London, England, secretary, Royal Aeronautical Society, June 10, 1949.

D. M. A. Leggett, London, England, technical director, R.A.S., June 10, 1949.

L. A. Wingfield, solicitor, R.A.S., June 10, 1949.

K. F. Tupper, M.E.I.C., Toronto, Ont., June 11, 1949.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Alexander Gray, M.E.I.C., who retired in 1946 as manager of the port of Saint John, N.B., passed away on June 6, 1949. He had been ill for some time.

As an engineer and harbour adminstrator his career was identified with that Atlantic port for nearly three decades.

Mr. Gray was born at Fearn, Ross-shire, Scotland, in 1881. He received his early education at the public school and Royal Academy, Tain, Scotland, and for seven years attended the evening classes at the Heriot-Watt Technical College, Edinburgh, and Dundee University. In 1896 he was engaged with Ordnance Survey of Scotland, remaining on this work until 1901, when he spent one year in the city engineer's office, Dundee, Scotland. The following year he was engaged on mine development work on the Gold Coast in West Africa in the capacity of assistant engineer, remaining in that country until 1905 in various engineering positions. Then he came to Canada, and was appointed assistant engineer with the Dominion Coal Company, Glace Bay, N.S., where he was in charge of erection of mine buildings and was also engaged on railway construction. For five years, from 1905, he was with the Grand Trunk Railway, occupying successively the positions of assistant resident engineer and resident engineer of maintenance, the latter position being in connection with the Ottawa division. In 1911 he was appointed assistant engineer in charge of the Ottawa River storage for the Public Works Department.

One of the first tasks entrusted to Mr. Gray when he was transferred to Saint John in 1917 was to represent the Dominion Government in a supervisory capacity during the construction of the dry dock, which was then the largest in the world. When the federal government took over the Saint John Harbour, Mr. Gray became chief engineer and general manager for the harbour commission, and he continued as port manager when the National Harbours Board was established in 1936.

One of his achievements was the building of the world's largest coffer dam as a necessary phase in the expansion of the West Side dock area out to the former Navy Island.

The Second World War was another period that exerted great stress on port facilities. Although the port manager's health was failing, he kept in constant touch with all harbour problems and personally contributed much to the efficient manner in which Saint John served Allied shipping. Last New Year's he was invested as a member of the Order of the British Empire for his meritorious services over a period of many years.

Mr. Gray was active in Engineering Institute affairs, serving as councillor in 1919-21, and as vice-president in 1934-35. He had joined as an Associate Member in 1907, transferring to Member in 1916. He was chairman of the Canadian Advisory Committee of the British Institution of Civil Engineers; a member of the American Society of Civil Engineers; and a director of the American Port Authorities Association.

Col. C. H. L. Jones, M.E.I.C., who was well known in the pulp and paper industry in Canada, passed away at Quebec on May 22nd, 1949. Colonel Jones was president of several Canadian paper companies, including the Mersey Paper Co. Ltd., Liverpool, N.S., and Price Brothers and Company, Limited, Quebec.

Colonel Jones was born in Montreal, Que., in 1876, and attended McGill University during the years 1891 to 1893. After graduation he worked on operation, maintenance-of-way and construction with the Canadian Pacific Railway Company.

During the year 1900 Colonel Jones was connected with the Algoma Central and Hudson Bay Railroad on construction work, in the years 1900-1903 he was associated in an assisting capacity in the planning and carrying out of engineering and construction details of the Algoma Central and Hudson Bay Railroad main line, and from 1904 to 1910 he was assistant general manager of the Lake Superior Corporation with direct responsibility over engineering and construction on the work carried out by that concern.

He then became associated with the paper industry, and was connected with the Sault Ste. Marie Pulp and Paper Company, Lake Superior Paper Company, The Spanish River Pulp and Paper Mills, Limited, Fort William Paper Company, Limited, and the Manitoba Pulp and Paper Company.

In 1928 he left the Spanish River Pulp and Paper Mills Company Limited, Sault Ste. Marie, Ont., where he was vice-president and manager of operations. He then joined the Mersey Paper Co. Ltd., at Liverpool, N.S., as president. He retired from his duties this year.

During the First Great War Colonel Jones organized the 227th Battalion, and commanded it until it was absorbed into other units, after which he was transferred to the command of the C.F.C., Central Group in France, which command he held for eighteen months.

Col. Jones joined the Institute in 1926 as a Member.

Charles H. Colwell, M.E.I.C., civil engineer of Fredericton, N.B., who died on May 13, 1949, was active in his position as office engineer for the Highway Division of the Department of Public Works up to the time of his death.

Mr. Colwell was born in South Devon in 1890. He lived in Woodstock for a time and was graduated by Woodstock High School in 1908 and the University of New Brunswick in 1912, with the degree of B.Sc. in civil engineering. He was draughtsman on the Valley Railway in 1912-14 and served overseas during the first World War, going over in 1915 with the 23rd Battery C.F.A., and serving in France with the 8th and 48th Battery. He also spent a year in Russia with the 67th Battery having a total service of four and a half years. He was awarded the Distinguished Conduct Medal for meritorious work in Russia and during the Second World War was a lieutenant with the 2nd 90th Battery (Reserve Army).

Mr. Colwell joined the Institute in 1942 as a Member.

NEWS of the BRANCHES

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Cape Breton

S. G. Naish, M.E.I.C.
Secretary-Treasurer

Major K. E. Gustafson, assistant chief engineer, Dominion Coal Company Limited, gave an interesting talk on his experiences in the Ruhr to the Cape Breton Branch of the Institute on April 11, 1949.

The speaker brought out the fact that Western Europe had to have Ruhr coal in order to make a recovery. The success of the Ruhr industry was accomplished by the co-ordinating of the coal and steel industries so that nothing was wasted. Also the coal and steel industries produced in the centre of their market. The concentration was such that four and a half million people lived in an area only twice the size of Cape Breton.

In proposing a vote of thanks to the speaker, S. C. Mifflen suggested that Mr. Gustafson's talk be reprinted in the *Journal* of the Institute. The motion was seconded by J. H. Fraser.

Acknowledgment was made of the arrangements carried out by Assistant Secretary Gordon Ross.

Dr. N. A. D Parlee announced for the programme committee, that the next speaker would be Dr. Harold Smith, director of the Nova Scotia Research Foundation.

Prospective members Jim McLaughlin, Ron Miller and John Gillis, and new member Cliff Murray were welcomed.

Niagara Peninsula

H. L. Weaver, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

On Friday, May 27, the Niagara Peninsula Branch completed the season's activities with a dinner meeting at the Red Casque Inn.

Following an excellent dinner retiring chairman R. A. Coombes, in a short address, thanked the members of the branch and of his executive for their fine support during the past year. He then called on A. G. Asplin, chairman elect for the coming year. Mr. Asplin introduced the members who have been elected to the executive for the 1949-1950 season and called on George E. Griffiths who introduced the speaker of the evening, E. G. Tallman, project engineer for The Hydro-Electric Power Commission of Ontario.

Mr. Tallman's subject was **The Agausabon Power Development** which is a topic always interesting to Niagara Peninsula men. The address was extensively illustrated with slides and the speaker covered very thoroughly the events which dictated the necessity for power development in the area and gave detailed information on the engineering studies on the project as well as the design and construction of the works.

A lively period of discussion at the close, proclaimed the interest of the members. M. F. Ker tendered a vote of thanks to the speaker which was supported by all present.

Peterborough

M. M. Uloth, M.E.I.C.
Secretary-Treasurer

J. C. Allan, M.E.I.C.
Branch News Editor

Eighty-five members and guests were present on May 19th to hear an address by Mr. F. Bainbridge, National Research Council, Chalk River on **Properties of Radio-Active Isotopes and their Industrial Application.**

Mr. Bainbridge introduced his subject with a review of the fundamental concepts of radioactivity for those of the audience who have not followed the subject closely. Also a few simple experiments were performed to demonstrate the ideas. The general history of the subject was also briefly outlined. Slides were used to illustrate the atomic structures and the Periodic Table.

The speaker concluded his address with a discussion of the uses of radioactive isotopes, in pure research, applied research and process control.

The development of atomic energy since the war has taken a new direction, focussing attention on beneficial peacetime application. It has now reached the point where a new industrial technology is possible. Chalk River is now in a position to make available to industry many of the fruits of intensive effort in the atomic energy field. How useful the atomic energy products become, and how much service they can give depends upon the ingenuity of industry.

Saguenay

T. T. Anderson, Jr.E.I.C.
Secretary-Treasurer

A meeting of the Saguenay Branch of the Institute was held at the Arvida High School on Friday, April 29, 1949.

K. R. Stock of the R. H. Nichols Company, Limited, addressed the meeting on the subject **A Fast A.C. System of Supervisory Control.**

Mr. Stock explained the application of supervisory control to sub-stations, and showed that considerable labour saving resulted from the application of the supervisory system, especially when the distance between power and control point was over one mile.

The speaker used demonstration equipment during his talk and showed clearly the flexibility of supervisory control.

Mr. Stock traced the history of the development of telemetering and supervisory control in the industrial field, and pointed out that there are already several oil company tank farms under supervisory control. He showed that practically any form of physical measurement could be made by means of the principles of telemetering.

The speaker was introduced by Vice-Chairman W. F. Campbell, and thanked by F. H. Duffy.

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A meeting of the Saguenay Branch was held at the Arvida High School, Tuesday, May 17, 1949.

The speaker was W. L. Pugh, M.E.I.C., chief engineer of the Aluminum Company of Canada, Limited — his subject **The New Powell Wharf at Port Alfred.**

Mr. Pugh described the design and construction of the modern new wharf built by Saguenay Terminals Limited at Port Alfred, Que., Canada's 8th largest port. This wharf is of rocker joint construction a design which has resulted in saving large quantities of reinforcing steel.

The necessity for the new wharf was apparent in 1946 and has been borne out by the fact that tonnages handled have increased from about 700,000 in 1939 to over 2,000,000 estimated for 1949.

The wharf is 1138 ft. long by 125 ft. wide. It can dock two large freighters simultaneously and has a minimum clear depth of 31 ft. at extreme low tide. Roadways lead directly to it, so that materials may, if necessary, be trucked or rail shipped directly to shipside. There is an 8 inch diameter oil connection at each berth and electric outlets are provided so that minor welding repairs may be carried out while the ship is in port.

The wharf is built in three sections to allow for a maximum expansion of 2 inches per section for a 100°F temperature differential. On the south face are located two gantry level luffing cranes with operating radius from 25 to 65 ft..

A very complete boring and testing programme was carried out during 1947 and 1948 prior to construction. An ingenious pile loading method which was capable of great accuracy, was used, and the general conclusion was reached that a friction pile loaded to 50 tons should have 60 foot penetration.

The wharf design also took care of a large ice load, since the port is ice bound 5 months of the year, a load of 1500 lb. per lineal foot to take care of ship sideways impact and a wind load of 35 lb. per lineal foot. The deck load was designed for 1000 lb. per sq. ft. Piling at shipside was designed to handle a load of 70 tons per pile, this latter load corresponding to two loaded locomotives side by side and loaded gantrys.

Allowance was made for corrosion in the final pile design, approximately 1/16 in. additional thickness being allowed for corrosion resistance. In addition the piles were painted with a copper bitumastic paint.

In all over 1,000,000 cu. yards of material were dredged out and disposed of to deep water by means of pipeline.

Following Mr. Pugh's very complete exposition, a film traced the construction step by step, showing the many ingeneous methods of handling the diverse construction problems encountered.

Mr. Pugh was introduced by W. P. C. LeBoutilier, chairman, and thanked by B. E. Bauman on behalf of the branch.

Junior Section

W. A. Dayton, M.E.I.C.
Secretary-Treasurer

A meeting of the Junior Section of the Saguenay Branch took place at the Arvida High School on April 22, 1949.

In his speech entitled **The Science of Music,** Frank A. Coleman described music as among the oldest of the arts and youngest of the sciences. With a wealth of illustrative anecdotes, the speaker outlined some of the difficulties which face an interpreter anxious to reproduce exactly the intentions of a composer. Not only have the form and sonority of many instruments changed, but new techniques and effects have been developed. Musical notation itself is young and indications of tempo have not always been taken seriously by composers themselves. More important, no precise notation to indicate interpretation has yet been developed.

Mr. Coleman's talk was accompanied by films prepared in England and America to illustrate the instruments of the orchestra and the conducting techniques of such artists as Arturo Toscanini and Sir Malcolm Sargent.

A large number of diversified questions demonstrated the interest shown by the audience.

He was introduced by the chairman and thanked by J. P. Estabrook on behalf of the section.

Sarnia

C. P. Sturdee, M.E.I.C.
Secretary-Treasurer

J. M. Garton, Jr.E.I.C.
Branch News Editor

On May 5th, sixty members of the Sarnia Branch met at Mirwin's Hotel, Wallaceburg for a dinner meeting arranged by the Juniors. Mr. J. Mallott, of the Dominion Glass Company, Limited, outlined the various steps involved in the manufacture of glass articles. Following Mr. Mallott's remarks a tour was made of the Dominion Glass Company's Wallaceburg plant. The operations were followed from the bins of sand and chemicals right through to the completed articles. The high speed automatic moulding machines for bottle and tumbler manufacture were of special interest.

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The Sarnia Branch on June 2nd had the pleasure of hearing Dr. G. B. Langford, Head of the Department of Geological Sciences, University of Toronto, speak on the subject of Shore Erosion, at a dinner meeting at the Sarnia Riding Club.

Dr. Langford's subject was of particular interest to the Sarnia Branch in view of the local shore erosion problem. The speaker outlined the study which had been made of the erosion problem on Lake Ontario. This study showed that major fluctuations in water levels on The Great Lakes are not caused by water removed or added by any man-made drainage project. Measurements of water into and out of Lake Ontario over a given period have indicated that water level changes are effected by seepage and evaporation factors over which man has no control. A method of combatting shore erosion involves community co-operation in the establishment of long beaches where damaging waves can expend themselves. Beaches can be built up by the construction of groynes which will prevent sand from being washed away.

The speaker was introduced by Dr. B. B. Hillary and thanked by D. H Welch. The four political candidates from Lambton County for the forthcoming federal election attended the meeting and gave their views on three questions which were put to them. These questions concerned the appointment of at least one engineer to the International Joint Commission. Tariff regulations concerning the importation of blueprints, and the employment of engineers from other nations for temporary work in Canada.

Also attending the meeting were Mr. James A. Vance, vice-president of the Institute, and Col. T. M. Medland, executive director of The Professional Engineers of Ontario.

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Sec.-Treas., C. P. STURDEE, Engineering and Development Division, Imperial Oil Limited, Sarnia, Ont.

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Sec.-Treas., D. W. HOUSTON, Box 101, Regina, Sask.

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Sec.-Treas., D. A. MACLEAN, Ass't Hydraulic Engineer, Water Rights Branch, Parliament Bldgs., Victoria, B.C.

WINNIPEG
Chairman, C. V. ANTENBRING
Vice-Chair., J. C. TRUEMAN
Executive, E. M. SCOTT, A. M. THOMPSON, R. N. SHARPE, J. L. CHARLES, A. J. TAUNTON, J. E. STAPLES, E. D. GAUER, J. W. GREENLAW
(Ex-Officio), H. W. McLEOD, D. M. STEPHENS
Sec.-Treas., G. W. MOULE, P.O. Box 541, Winnipeg, Man.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

July 21st, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate *

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the September, meeting.

L. AUSTIN WRIGHT, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have heen engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized hy the council shall he required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in whicb he bas been engaged.

A **Junior** shall have heen engaged in some branch of engineering for at least four years. This period may he reduced to one year, if the candidate for election bas graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall he required to pass an examination in engineering science as prescrihed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing be makes application hefore the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved hy council.

Council may extend the above limits if in its opinion special circumstances warrant sucb extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to tbe final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized hy tbe council or shall hc required to write examinations as prescrihed by the council.

He sball be:

a. pursuing a course of instruction in a school of engineering recognized hy the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in wbich case be sball be transferred to Junior witbout payment of transfer fee providing be makes application hefore attaining age twenty-five and his application is approved by council.

He sball not remain in tbe class of Student after be has attained the age of twenty-five, unless in tbe opinion of council special circumstances warrant tbe extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but wbose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

Tbe fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed hy such members.

For Admission

BALLANTYNE—ANDREW GEORGE, of Rossland, B.C. Born at Redcliff, Alta., June 15, 1920. Educ.: B.Sc., (Civil), Alberta, 1943; R.P.E., Alta.; 1940-41, (summers), rodman, Canada Land & Irrigation Co., Medicine Hat; student asst., Dept. Mines & Resources (Topo. Branch); 1942, (summer), instru'man., Dept. Transport, Nelson, B.C.; 1943, (March to Nov.), instru'man., Ft. St. John; 1943-44, engr., Metcalfe, Hamilton, Kansas City Bridge Co., Dawson Creek; 1944-46, jr. engr., Dept. of Agriculture, P.F.R.A., Regina, Sask.; 1946 to date, design engr., Consolidated Mining & Smelting Co., Trail, B.C.

References: D. W. Hays, V. E. Thierman, W. L. Foss, G. L. Mackenzie, A. C. Ridgers, J. V. Rogers, E. Mason, E. M. Stiles, J. P. Svarich.

BARKER—ALASTAIR JAMES, of Niagara Falls, Ont. Born at Strathaven, Scotland, Feb. 6, 1928. B.Sc., (Civil Engrg.), Edinburgh Univ., 1948; Student, Inst. C.E., London; 1946, (summer), student engr., general, field & drawing office work, Blyth & Blyth, consultg. civil engrs., Edinburgh; 1947, (summer), asst. engr., work on layout & genl. constrn., housing project, G. Wimpey & Co., Ltd.; 1948-49, graduate civil engr., survey work both in field & drawing office of location surveys branch, Dept. of Highways, Ontario; civil engr., work in office mainly on reinforced concrete, H. G. Acres & Co., Niagara Falls, Ont. March 1949 to date.

References: H. E. Barnett, H. S. Lundy, A. W. F. McQueen, C. A. O. Dell, A. J. Ring.

BASSADONE—ALBERT LOUIS, of Montreal, Que. Born in Huelva, Spain, June 4, 1915. The Polytechnic, London, 1932-37, Higher National Certificate, Elect. Engrg., 1937; Graduate, Inst. Electrical Engineers, London; 1938-40, test and research asst., testing high voltage cables and research on the gas pressure cable developed by co., lab tests of insulation, oils, etc., Enfield Cable Ltd., Middlesex; 1940-44, mtce. engr., transmitter engr. and mtce. of transmitters and associated equipt., incl. audio line equipt., British Broadcasting Corp., London; 1944-48, test and research engr., test development of flexible wave guides and impregnated paper, dielectrics, etc. B.I. Callender's Cable Test & Research Dept., England; Oct. 1948 to Feb. 1949, engrg. service dept., Pratt & Whitney Aircraft Co., Montreal; 1949 to date, engrg. dept., Phillips Electrical Works, Montreal, Que.

References: J. G. Kerfoot, T. A. Lindsay, A. Sandilands, D. A. S. Laing, J. S. Waddington.

BERRY—HENRY DERYCK, Major, R.C.E., of Vancouver, B.C. Born at Payette, Idaho, Dec. 17, 1911. Educ.: B.Sc., (Mining Engrg.), Alberta, 1940; 1937-39, (summers), chainman, rodman, instrument work, geological survey, Canadian Western Natural Gas Co., Calgary; chainman, rodman, pipeline survey, Northwestern Utilities Ltd., Edmonton; prospector, Consolidated Mining & Smelting Co., Yellowknife, N.W.T.; R.C.E., as follows: 1940-41, Lieut., 1941-42, Capt. & Adjt., Canada & U.K., 1943, Major. O.C. Training Coy, Staff Course, R.M.C., Kingston. 1943-45, Tech. Staff Officer, Canadian Military Hdqts., London, O/C Field Park Coy., Italy and N. W. Europe, etc., 1946-47, Supervisor, Executive & Prof. Divn. Unemployment Insurance Commission; with R.C.E., rank of Major, as follows: 1947 (Aug.) to (Dec.) 1948, Second-in-Command to Area Engineers, B.C. Area Active Force, mtce. & constrn., all Department of National Defence in area, 1948 to date, Area Engineer, responsible for mtce. all armouries, garrisons, forts, ranges, stations, design, planning and execution of constrn. and mtce. projects, involving housing projects, reinforced concrete structures, etc., B.C. Area (also commanding II Works Coy., R.C.E.).

References: J. P. MacKenzie, J. C. Oliver, G. P. Stirrett, W. G. Swan, E. L. Hartley, J. C. Byrn, H. M. B. Inglis, R. S. L. Wilson, H. W. Love, J. S. Beeman, J. Garrett.

BINA—JOHN H., of Montreal, Que. Born at Ceske, Czechoslovakia, March 1, 1906. Educ.: Graduate Elect. Engr., Tech. of Vienna, 1933, second graduation obtained at Tech. Univ. of Prague; Licensed P.E., Quebec; 1923-27, project engr., Siemens Schukert Works in Vienna; 1927-38, elect. engr. and asst. to chief engr. engrg. dept., Brux Coal Mining Co., Most, Czechoslovakia (large industrial operators with affiliated companies, steel, etc.); 1939-47, field production expert, supervisor, designer, elect. heating equipt., farm implements; also, while associated with company did a great amount of consulting engrg. work, R. Kamenicky, elect. engrs., Pilsen Czechoslovakia; 1949 to date, elect. engr., engrg. dept., Dominion Textile Co. Ltd., Montreal, Que.

References: E. B. Jubien, H. S. Weldon, W. C. M. Luscombe, R. B. Wotherspoon, C. A. Barber.

BLAIR-McGUFFIE—MALCOLM HUGH, of Deep River, Ont. Born at Leamington Spa, Eng., Oct. 6, 1912. Educ.: B.Eng., (Chem.), McGill, 1935; with T. Hedley & Co., (English subsidiary of Proctor & Gamble), 1935, factory trainee, 1935-37, dept. mgr., powder prod.; with I.C.I. (Dyestuffs) Ltd., as follows: 1937-38, chemical engr., attached to physical chem. section, Grangemonth works, Scotland. 1938-42, works chem. engr., Trafford Park Works: 1942-45, prod. mgr., war gases and chemicals, Defence Research Establishment, Ministry of Supply (on loan from I.C.I. Ltd.); 1945-46, works chem. engr., I.C.I. (Dyestuffs) Ltd., Trafford Park, England; 1946-48, mgr. of the chem. engrg. group, distillers br., Research & Development Dept., England; at present head of chem. engrg. branch, Atomic Energy Project, National Research Council, Deep River, Ont.

References: J. B. Phillips, H. B. Bowen, C. J. Mackenzie, I. N Mackay.

BOISJOLY—RAYMOND LEONIDAS, of Shawinigan Falls, Que. Born at Montreal, Que., Jan. 29, 1924. Educ.: B.Eng., (Mech.), N.S.T.C., 1948; 1949, asst. field engr., Shawinigan Engineering; at present, jr. engr. in training, mtce. dept., carbide division, Shawinigan Chemicals Ltd., Shawinigan Falls, Que.

References: S. J. Montgomery, M. L. Baker, L. A. Robillard, J. A. Burke.

BRAIS—ROGER, of Montreal, Que. Born at Montreal, Feb. 11, 1910. Educ.: B.A.Sc., C.E., Ecole Poly., 1933; R.P.E., Quebec; 1934-35, chemist, Provincial Health Dept.; 1935-38, consultg. chemist and engr. for mines, and engr. for City of Amos, Abitibi; Ecole Polytechnique, as follows: 1938-45, asst. professor of chemistry, 1945-48, associate professor of chemistry, 1948 to date, professor of chemistry and chemical engrg.

References: I. Brouillet, H. Gaudefroy, J. A. Lalonde, R. Boucher, T. J. Lafreniere, L. Cartier.

BREDIN—EZEKIEL EDMUND, of Sarnia, Ont. Born at Toronto, Ont., Jan. 20, 1924. Educ.: B.Sc., (Mech. Engrg.), Queen's, 1948; 1946, (summer), instru'man., surveying, Ontario Dept. of Highways; with Imperial Oil Limited, Sarnia, Ont., 1947, (summer), dftsman., engrg. office, at present zone engr., mech. dept.

References: G. W Christie, S. V. Antenbring, R. A. McGeachy, W. D. Suitor, C. P. Sturdee.

BRIDGMAN—ARTHUR GRAHAM, Lt. Cdr. (E), R.C.N., of Halifax, N.S. Born at Pelly, Sask., Nov. 4, 1917. Educ.: B.Sc., (Mech.), Saskatchewan, 1941; 1941-42, Jr. Engr., H.M.S. "Despatch", 1942-47, as Chief Engr., H.M.C.S., Quinta, Red Deer, Clayquot, Stone Power, Haida; served in three appointments ashore—a combination of engrg. and administrative duties; at present, Officer in Charge of "Alterations and Additions," Dept. H.M.C. Dockyard, Halifax, N.S.

References: R. K. Thoman, H. G. Seybold, J. S. Somers, J. B. Mantle, N. B. Hutcheon.

COLE—ERNEST JULIAN, of Ottawa, Ont. Born at Anerley, Sask., April 6, 1916. Educ.: B.Sc., (Civil), 1944; B.A. (Physics), 1946, Saskatchewan; 1941, (summer), erection Dept. of Telephones, Regina. 1942, (summer), dftsman., Dominion Bridge Co., Montreal, 1943-45, 2nd Lieut., R.C.E.; 1945-46, Instructor in Engrg., Univ. of Saskatchewan; 1946-48, design engr., Dominion Bridge, Montreal and Winnipeg; 1949 to date, struc. and mech. designer, plant engrg. services, (asst. research officer), National Research Council, Ottawa, Ont.

References: R. A. Spencer, G. W Parkinson, H. M. White, M. J. Lupton, O Olsen, J. C. Elliott, C. Garrett.

CRERAR—NORMAN STEWART, of Arvida, Que. Born at Govan, Sask., Jan. 11, 1912. Educ.: B.Sc., (Elect.), Manitoba, 1938; R.P.E., Quebec; 1929 & 1930, (summers), constrn. survey, C.P.R. & C.N.R.; 1931-35, apprentice elect. course (completed), Hudson Bay Mining & Smelting Co., Flin Flon, Man.; 1933-39, test course, Canadian General Electric, Peterboro; with Aluminum Co. of Canada, as follows: 1939-43, chief operator, power dept., Arvida, 1943-44, asst. elect. supt., Arvida, 1944-45, works mgr., La Tuque, 1945-46, asst. works mgr., Kingston, 1946 to date, asst. to vice-pres., Sun Life Bldg., Montreal, Que.

References: J. W. Ward, J. F. Braun, G. T. Malby, McN. DuBose, T. T. Anderson.

DAVIS—GUY MICHAEL KERR, of Arvida, Que. Born at Abergavenny, Eng., Feb. 2, 1923. Educ.: B.Sc., (Eng.), London Univ., 1948; Student Inst. Civil Engrs., London; 1941-46, Royal Engineers, incl. 6 mos. special Army engrg. course at Birmingham Univ., engaged in all types of field engrg., 3 yrs. & 2 mos. spent on this type of work in Persia, Iraq, Syria, India—with rank of Captain· 1947, (3 mos.), civil engrg. dept., Lochaber Works, British Aluminium Co., Scotland; 1948, (3 mos.), bridge designer, bridge design office, Dept. of Highways, Ontario; at present, civil engr., genl engrg. dept., Aluminum Company of Canada, Arvida, Que.

References: A. C. Johnston, F. Calder, W. P. C. LeBoutillier, T. T. Anderson, A. Robert.

DAVIDSON—THOMAS NEIL, of Montreal, Que. Born at Ottawa, Aug. 14, 1917. Educ.: B.Sc., (Elect.), Queen's, 1941; 1939 & 1940, (summers), Bell Telephone Co.; 1941-42, sales engr., carbon sales division, Canadian National Carbon Co.; 1942-45, Elect. Lieut., Royal Canadian Navy; 1945 to date, telephone equipt. engr., Northern Electric Co., Ltd., Montreal, Que.

References: W. C. M. Luscombe, T. E. Bradshaw, E. H. Hayes, J. H. Budden, W. N McGuinness.

DRUPALS—HENRY, of Montreal, Que. Born at Riga, Latvia, April 10, 1909. Educ.: Civil Engr., Univ. of Latvia, Riga, 1942; with Latvian Railways, 1928-40, dftsman and designer, 1940-42, supervisor of industrial bldgs.; 1942-44, tech. supervisor, Latvian Trade Co-operative, Riga, Latvia; 1946-47, asst. chief of constrn. group with U.S. Army at Stuttgart, Germany; 1947-48, engr. with genl. contractor, Th. Hermanouski, Stuttgart, Germany; 1948 to date, detailer, designer, Stadler, Hurter & Co., Montreal, Que.

References: A. T Hurter, I. Kursbatt, F. M. Kraus, P. Bastien, J. W. Boelen.

FASKEN—NORMAN ROTHWELL, of Shawinigan Falls, Que. Born at Regina, Sask., Feb. 18, 1911. Educ.: B.A.Sc., 1933; M.A.Sc., 1939, Toronto; 1933-37, chief chemist, research and analytical lab., Dr. H. Zeidler, Toronto; Shawinigan Chemicals, 1940-42, research engr., plant research dept., 1942-45, genl. foreman, lime & coke plant; with Shawinigan Water & Power Co., as follows: 1945-46, research engr., 1946-49, supervising engr., 1949 to date, acting director, research dept., Shawinigan Falls, Que.

References: H. K. Wyman, J. S. Whyte, A. F. G. Cadenhead, J. B. Challies, P. S. Gregory, C. K. Lockwood, R. S. Lane.

FLORAS—DEMETRIOS, of Toronto, Ont. Born at Constantinople, Turkey, April 28, 1910. Educ.: Diploma, Civil Engr., 1929; Dr. Civil Engrg., 1947, Athens National University; 1929, (2 mos.), structl. engr., Trianti Flour Mills; 1929, (2 mos.), design engr., Technikee Construction Co., Athens, engaged in earthquake-resistant constrn. design; 1930-31, design engr., Lasco Constrn. Co., Athens, (earthquake-resistant design); 1931-32, design engr., bldg., reinforced concrete design, Department of Public Works; 1932-34, structl. engr., housing design reinforced concrete, Bldg. Assn. of National Bank of Greece; 1934, genl. designing and superint'ng during constrn. of bldg. and villas, Athens; 1935, design of sanatoria for Ministry of Hygiene, genl. design and supt of constrn., 2 villas; 1935, genl. design and supt., constrn. of four villas, Athens; 1937, designing and planning for erection of School of Nursing and Visiting Sisters of School of Hygiene, Athens, genl. designing and supt., bldgs. and villas; genl. designing and supt. during constrn., chateau, Mrs. M. Tetene, Ekali, Athens, and four villas at Ekali; 1944-45, postgraduate work for Doctor's degree in Civil Engrg.; Dec. 1946 to August 1947, structl. engr., Foundation Co. of Ontario, Toronto; reinforced concrete design, Foundation Company, Montreal; since June 1947, Consul of Greece, Toronto, Ontario.

References: J. G. Hall, R. F. Shaw

GAGNON—BERNARD EDMOND ULRIC, of Lachine, Que. Born at Vancouver, B.C., Sept. 25, 1914. Educ.: B.A.Sc., (Mech.), B.C.; 1946; 1938-41. mine sampling, surveying and ventilation, Bralorne Gold Mines; 1944-46, Lieut. (E), R.C.N.V.R.; 1947-48, dftsman., designer, Dominion Engineering Works; 1948 to date, mech. engr. and dftsman., Stadler, Hurter & Co., Montreal, Que.

References: K. R Meyer, A T. Hurter, C. R. Matthews, V Harisay, F. C. Woods.

GAMBLE—TERRY STRATFORD, of Shawinigan Falls, Que. Born at Montreal, Que., June 29, 1921. Educ.: B.A.Sc., (Metall.), Toronto, 1945; 1941 & 1942, (summers), Kerr Addison Gold Mines; machine runner underground; with Shawinigan Chemicals, Ltd Shawinigan Falls, Que., as follows: 1945-49, plant metallurgist, stainless steel & alloy division, 1949 to date, i/c lab., engaged in research & control work, stainless steel & alloys divn.

References: E. R. Williams, H. K. Wyman, J. S. Whyte, M. Eaton, E. T. Buchanan.

GODARD—EARLE TREVOR, of Montreal, Que. Born at Estevan, Sask., June 29, 1920. Educ.: B.Sc., (Mech. Engrg.), Saskatchewan, 1942; 1943-45, Engr. Officer, R.C.N. 6 mos. Damage Control Officer, responsible for training ship's personnel 6 mos i/c machine and sheet metal shop, responsible for all repairs to ship's machinery, 3 mos. Watchkeeping Engr. on turbine driven cruiser, 12 mos. Watchkeeper and Engr. Officer aboard destroyer; 1946 to date, methods engr., Northern Electric Co., Ltd., Montreal, Que.

References: I. M. Fraser, N. B. Hutcheon, R. A. Spencer, E. K. Phillips, J. H. Budden.

GRAY—GEORGE ALLEN, of Montreal, Que. Born at Brighton, Eng., Sept. 7, 1919. B.Sc., (mech.), Queen's, 1949; 1940-42, Naval gun mounting inspector, British Admiralty Technical Mission, Ottawa; 1942-45, Radar Mechanic, R.C.A.F.; 1947, (summer), dftsman., Ford Paper Co.; at present, sales engr., Canadian Ingersoll Rand Company, Montreal, Que.

References: D. C. Crothers, G. M. Dick, H. G. Conn, F. G. Ferrabee, R. E. Edson, D. A. Gray.

HAHHAD—VICTOR ALEX., of Montreal, Que. Born at Rawdon, Que., Sept. 3, 1922. Educ.: B.Eng., (Mech.), McGill, 1948; R.P.E. Quebec; Aug. 1948 to date, design and project engr., industrial engrg. drawing office, Canadian Vickers Limited, Montreal, Que.

References: C. A. Robb, J. A. Coote, R. Killam, P. W. Gooch, G J Dodd.

HAZLE—JOHN ROBERT, of Shawinigan Falls, Que. Born at Quebec, Que., Sept. 25, 1922. Educ.: B.Eng., (Chem.), McGill, 1945; 1945-46, supervisor, Defence Industries Limited, Chalk River, Ont.; 1946-48, jr. research officer, National Research Council, Chalk River, Ont.; 1948 to date, supervisor, Canadian Resins & Chemicals, Shawinigan Falls, Que.

References: R. W. Fugler, J. C. Hamilton, C. G. de Tonnancour, R. DeL. French, G. N. White.

HIRST—WILLIAM LESLIE, of Grand Falls, N'fld. Born at Greenfield, England. May 18, 1923. Educ.: B.A.Sc., (Mech.), Toronto, 1944; 1941-42, (summers), machinist, United Steel Corp.; toolmaker, John Hepburn Co.; 1943-46, R.C.N.; 1946-48, service work, design, Canadian Ingersoll Rand Co.; 1949 to date, asst. mill engr., Anglo Newfoundland Development Co., Grand Falls, N'fld.

References: F. M. Pratt, H. Windeler, E. L. Ball, E. T. Harbert, G. M. Sutherland. E. A. Allcut.

HOUGHTON—JOHN RUSE, of Beaconsfield, Que. Born at London, Ont., April 2, 1913. Educ. B.Eng., (Mech.), McGill, 1935; R.P.E., Quebec with Northern Electric Co., Ltd., Montreal, as follows: 1935-41, mfg. methods engr., 1941-46, supervisor, mfg. methods engrg., 1946 to date, asst. supt. mfg. methods.

References: C. A. Peachey, E. G. Gagnon, E. Brown, C. M. McKergow, H. K. Morris, I. N. McKay.

HOWLEY—MICHAEL FRANCIS, of St. John's, N'fld. Born at St. John's, N'fld., Sept. 3, 1924. Educ.: B.Eng., (Civil), McGill, 1948; 1942-43-44, (summer), dftsman, Defence Industries Ltd., Montreal dftsman, R.C.N., Armament Depot, St. John's; instru'man, St. John's Housing Corp.; 1945-46-47, (summers), chief of party, constrn. work, J. W. Beretta, engrs., San Antonio, Texas; 1948-1949, (March), jr. engr., Searles & Meschino Ltd., engrs., architects, community planners, St. John's, N'fld.

References: J. T. Howley, L. J. Barron, C. E. Cook, R. E. Jamieson, R. DeL. French, G. J. Dodd.

KLASSEN—JACOB, of Lachine, Que. Born in Russia, Nov. 28, 1921. Educ.: B.Eng., (Chem.), Saskatchewan, 1943; R.P.E. Quebec; 1943-46, divisional engr. division of applied biology, National Research Council, Ottawa; 1947 to date, chief engr. engaged in refrigeration and air conditioning, Engineering Installations Limited, Que.

References: R. A Spencer, N. B. Hutcheon, R. Bing-Wo, R. R. Duquette, F. J. Freidman, R. J. Fyfe.

LONG—NORMAN THOMAS, of Toronto, Ont. Born at Taunton, Eng., Nov. 28, 1923. Educ.: B.Sc., (Inter.), Univ. of Bristol, 1947; Student, Inst. Civil Engineers; with City of Taunton, as follows: 1939-42, articled pupil, 1942-43, engrg. asst., 1946-47, res. engr.; 1947-48, deputy city engr., City of Wells, Eng.; 1948 to date, design of drainage and sewage disposal works, H.E.P.C. of Ontario, Toronto, Ont.

References: W. M. Walkinshaw, A. Hadley, I. F. Shellard, (A.M., I.C.E.), E. L. Key, (A.M., I.C.E.), G. S. Edwards, (A.M., I.C.E.).

MACKENZIE-KENNEDY — CHESSBOROUGH VLADIMIR, of Montreal, Que. Born at St. Petersburg, Russia, March 23, 1911. Diploma. Mech. Engrg., Battersea Polytechnic College, 1935; R.P.E., Quebec; A.M., Inst. Mech. Engrs.; 1932-35, apprent., O. I. Keller, engrg. works, Riga, Latvia; with Harland & Wolff Ltd.; Belfast, as follows: 1936-38, dftsman. in Diesel dept.; 1938-39, design engr., design and test dept., 1939-42, sr. eng dftsman, 1942-44, design and instln. engr., Southampton; 1944-45, design engr., Engineer-in-Chief's dept., Admiralty, Bath; 1945-49, Tech. Control Officer, Industry Division, Control Commission for Germany (B.E.); Senior Officer I/C shiprepair and engrg. industry, Emden-Wilhemshaven area; 1948-49, engr. I. Canadair, Montreal; at present, design engr. methods dept., Montreal Locomotive Works.

References: J. H. Blueth, J. Sobolewski.

McMEEKIN—ROBERT WILSON, of Windsor, Ont. Born at Larne, N. Ireland, March 22, 1922. Educ.: B.Sc., (Civil), Wayne University, Detroit, Mich. (acc. ECPD), 1949; Canadian Bridge Co., Ltd., Windsor Ont., 1942-45, dftsman, 1949 to date, engrg. dept.

References: F. J. Pollock, W. G. Mitchell, C. S. Neilson, P. E. Adams, J. M. Wyllie, W. R. Mitchell.

MARMOREK—HENRY STEPHEN, of Montreal, Que. Born at Vienna, Austria, Sept. 5, 1919. Educ.: B.A. (Mech. Sciences), 1940; M.A., 1944; Cambridge Univ.; A.M., Inst. Mech. Engineers, London; National Gas and Oil Engine Co., Ltd., Lyne, Lancs, Eng., as follows: 1941-42, prod. training, 1943-42, independent design; 1943-47, Captain R.E.M.E., British Army, control of workshops employing 200 to 350 men, repair and overhaul of all types of Army equipt.; 1947-49, prod. engr., prod. methods, improvement and plant mtce., John Mills & Co., Llanidloes, Wales; at present, product engr., Canadian General Electric Co., Montreal, Que.

References: A. E. Bamford (M.I.M.E.), J. Jones (M.I.M.E.), F. Wood (A.M., I.M.E.), E. Stearns, W. D. Laird.

MARSHALL—WALTER INGRAM, of Niagara Falls, Ont. Born at Toronto, Dec. 9, 1925. Educ.: B.A.Sc., (Mech.), Toronto, 1948; 1946, (summer), engrg. records clerk, Bell Telephone Co.; 1947, (summer), production expediting, Canadian Acme Screw & Gear; May 1948 to Feb. 1949, engrg. asst. in plant dept., western area, Bell Telephone Co. of Canada; Feb. 1949 to date, hydraulics dept., H. G. Acres & Co., Niagara Falls, Ont.

References: A. W. F. McQueen, H. S. Lundy, J. Ings.

MATHESON—HOWARD WALTER, of Hudson Heights, Que. Born at Shawinigan Falls, Aug. 12, 1918. Educ.: B.Eng., (Mech.), McGill, 1944: 1940-41, (summers), shop experience on marine engines and dftng. experience; 1942 (summer), material engrg., United Shipyards; Trans-Canada Airlines, 1947-49, group leader, power plant engrg., group consisted of engrs. and technicians, 1949 to date, sr. engr. i/c of aircraft power plant engrg., Dorval base, design development, mtce & service, trouble shooting and overhaul requirements.

References: J. T. Dyment, D. L. Mordell, W. Boggs, J. F. LeCavalier, W. N. McKay, E. Brown, R. DeL. French, A. A. Hink.

MARTIN—JOHN WILLIAM, of Quebec, Que. Born at Quebec, Feb. 23, 1922. Educ. B. Eng., (Mech.), N.S.T.C., 1948; 1947, (summer), machinist, St. Lawrence Metal & Marine Works, Quebec; 1948 to date, mech. engr., engrg. dept., Quebec Power Co., Quebec, Que.

References: P. A. Duchastel, L. Swift, J. St.. Jacques, H. Beique, E. D. Gray-Donald.

MONTPETIT—GUY, of Montreal, Que. Born at Montreal, Que., July 23, 1905. Educ.: B.A.Sc., C.E., Ecole Poly., 1929; R.P.E., Quebec; 1929-31, constrn. engr., E. G. M. Cape & Co.; 1931-34, constrn. engr., Collet & Freres, contractors; 1934 to date (6 yrs. overseas as Lt. Col., Army), Leblanc & Montpetit, consultg. engrs., Montreal, Que.

References: I. Brouillet, A. Frigon, H. Gaudefroy, L. E. Langevin, J. A. Lalonde, H. Massue, E. A. Ryan, J. B. Stirling.

O'DELL—ARTHUR JOHN, of Arvida, Que. Born at Loughborough, Eng., May 5, 1907. Educ. Diploma in Elect. Engrg., Loughborough Engrg. College, Eng., 1929; A. M., Inst. Elect. Engrs., London; General Electric Co., Ltd., Birmingham, Eng., 1929-30, tester, 1930-31, charge hand on test bed; with Bastian & Allan Ltd., London, as follows: 1932-34, tech. asst., elect. and mech. design of complete instalns., electric & thermostatic control schemes, etc., 1934-36, tech & sales engr., responsible for design and drawing office, 1936-38, chief tech. and sales engr., i/c of all tech. and sales work, 1938-45, chief engr. and mgr., sr. executive of company and asst. to managing-dir., responsible for design and drawing office; 1945-48, partner in Brandt & O'Dell, consultg. engrs., London, Eng.; at present, sr. design engr., Arvida works, Aluminum Co. of Canada Ltd.

References: C. W. Bullock, E. F. Hartwick, G. V. Reinhardt, J. F. Braun, W. Fraser.

OLDERSHAW—MALCOLM JAMES, of Montreal, Que. Born at Chatham, Ont., Feb. 8, 1922. Educ.: B.A.Sc., (Elect.), Toronto, 1945; 1943 & 1944, (summers), test course, Canadian General Electric Co.; technician in approvals lab., Canadian Standards Association; 1945 to date, test set design engr., Northern Electric Co., Ltd., Montreal, Que.

References: W. N. McGuiness, A. J. Lawrence, C. A. Peachey, J. H. Budden, C. R. Young.

OSTAPOVITCH—HAROLD JOSEPH, of Montreal, Que. Born at Theodore, Sask., Aug. 23, 1923. Educ.: B.Sc., (Mech.) Saskatchewan, 1946; Northern Electric Co., Ltd., as follows: 1946-47, jr. engr., methods dept., 1948 to date, equipt. engr., telephone equipt. division.

References: I. M. Frazer, N. B. Hutcheon, T. T. Boutellier, J. H. Budden, E. H. Hayes.

PAKALNINS—ANDREJS, of Montreal, Que. Born at Walday, Russia, Nov. 19, 1915. Educ.: Civil Engr., 1941, Univ. of Latvia; 1943, Constrn. Engr., Univ. of Berlin, 1943; D. Engrg. Sciences, Univ. of Latvia, 1944; with Univ. of Latvia, Riga, as follows: 1936-41, Sub-Asst., professorship in water supply and sanitary constrn. (lab. supervising of designs, part-time lecturing), 1941-44, Asst. Prof., professorship for water supply & sanitary constrn. of Faculty of Engrg. Sciences; during 1941-42, design engr., water supply railway administration of Latvia, Riga and during period 1942-44, chief engr., i/c water supply, railway administration; 1945-46, design engr., 1265 Engr. Combat Battalion, U.S Engrs., Gussen and Bremen, Germany; at present, designer, water supply and sewerage, Stadler & Hurter, Montreal, Que.

References: A. T. Hurter, F. M. Kraus, I. Kursbatt, P. J. Kunstler, V. Harisay.

PLAMONDON—CHARLES-EDOUARD, of Quebec, Que. Born at Quebec, Aug. 12, 1918. Educ.: B. Eng., (Elect.) McGill, 1943; R.P.E., Quebec; 1940-41-42, (summers), student work, Anglin Norcross, Radio Canada; 1943-46, transmitter design, antenna work, audio equipt. design, RCAF Radio Repeater Stn. on Gaspe Coast, mtce. & instruction of personnel, Northern Electric Co., Montreal, Que.; with Quebec Power Co., Quebec, as follows 1947, i/c of instln. operation and mtce. of FM radio network, 1948 to date, i/c of systems calculations.

References: E. D. Gray-Donald, H. F. Beique, P. A. Duchastels, J. St. Jacques, L. Swift, G. E. Sarault, S. Sillitoe.

PRESCOTT—RONALD REID, of Gatineau, Que. Born at Walton, N.S., March 14, 1907. Educ.: B.Eng., (Elect.), N.S.T.C., 1932; 1932-40, chief electrician, St. Anthony Gold Mine, Savant Lake, Ont.; 1940-47, asst. elect. supt., N.B. International Paper Co., Dalhousie, N.B.; 1947 to date, asst. elect. supt., Canadian International Paper Co., Gatineau, Que.

References: O. S. Craik, C. E. Brain, J. L. MacArthur, G. D. Davidson, L. Sterns.

RICHMOND—ROBERT DICK, of Montreal, Que. Born at Winnipeg, Man., Jan. 13, 1919. Educ.: B.Sc., (Aero. Engrg.), Univ. of Michigan, (course acc. ECPD), 1942; M., Inst. Aero, Sciences; 1942, (8 mos.), jr. engr., National Research Council; with Fairchild Aircraft Ltd., as follows: 1943-43, stress engr., 1943-44, develop't. engr. 1944-47, chief of aerodynamics; 1947-48, chief of aerodynamics, Cancargo Aircraft Co.; 1948 to present, aerodynamic section chief, Canadair Limited, Montreal, Que.

References: J. J. Green, J. A. T. Butler, J. P. Donnelly, J. A. Lundy, H. S. Rees.

ROBERTSON—JAMES DOUGLAS, of La Tuque, Que. Born at Renfrew, Ont., Nov. 2, 1920. Educ.: B.Sc., (Elect.), Manitoba, 1944; 1944-47, test engr., Canadian Westinghouse Co., test course and service dept.; with Brown Corporation, La Tuque, Que. Jan. 1947 to April 1948, elect. engr., supervising contractor in elect. rehab. program covering new low-voltage substation (3000 K.V.A.), conversion of 600volt OCB's to ACB's, reactor instln. and extensive changes to motor control equipt. and low-voltage dist. system, etc., 1948 to date, mill elect. engr., repair, mtce. and constrn. in pulp mill (sulfate), head of elect. dept., all types of rotating equipt., various types of circuit breakers, etc.

References: J. M. Jopp, M. Hall, E. V. Caton.

ROSBOROUGH—THOMAS HUTCHINSON, of Kapuskasing, Ont. Born at Grenfell, Sask., April 18, 1910. Educ.: B.Sc., (Elect.), Queen's, 1932; R.P.E., Ontario; summers, highway constrn. materials (business mgr.); with R.C.A.F., as follows: 1940-41, Aero. Engrg. course, 1941-45, various engrg. positions including Chief Engr at Service Flying Schools and Engr. No. 1 at 2 Air Command in Winnipeg, retired with rank of Wing Commander; 1945-47, constrn. supt., S. S. Kresge Co. Ltd., Toronto; 1947 to date, townsite engr., full responsibility for co.'s holdings in town exclusive of mill, Spruce Falls Power & Paper Co., Kapuskasing, Ont.

References: G. M. Minard, C. W. Boast, H. L. B. Seifert.

SMALLIAN—ROBERT JAMES, of Ottawa, Ont. Born at Fort Frances, Ont., May 21, 1915. Educ.: Graduate, R.M.C., 1937; B.Sc., (Civil), Queen's, 1938; 1938-39, Works Officer, H.Q. Military District 4, Montreal, Dept. National Defence; 1939-44, as Field Engr., and finally O/C; 1945-46, DCRE 3 Works Section, 1 Canadian CRE Works; 1946-47, DAQMG, Directorate of Works and Accommodation, Army Hdqts., Ottawa; at present asst. mgr. Capital Wire Cloth & Manufacturing Co. Ltd., Ottawa, Ont.

References A. G. L. McNaughton, G. R. Turner, N. E. Rodger, J. L. Melville, H. W. Love, M. C. S. Brown.

SMITH—GEORGE WESTWOOD, of Hamilton, Ont. Born at Elmira, Ont., Oct. 14, 1900. Educ.: B.A.Sc., Toronto, 1923; R.P.E., Ontario; 1921 & 1922, (summers), survey asst. on municipal works, Barber-Wynne-Roberts & Seymour, constrn. engrs.; 1923-24, asst. engr., municipal work, Horace L. Seymour; 1924-25, res. engr., sewer tunnel constrn, James Proctor & Redfern Ltd., consultg. engrs.; 1925-26, asst. i/c of survey Lake Maracaibo, Lago Petroleum Corp., Venezuela, S.A., 1926-32, res. engr., water sewerage, plant constrn., pavements, Dryden, Scarborough, North Bay, Capreol, Nepean Township, etc., for James. Proctor & Redfern Ltd.; 1933-36, airport constrn., Dept. National Defence; Dept. of Transport on airport constrn., as follows 1936-39, district airway engr., Kapuskasing, 1939-40, dist. airway engr., North Bay, 1940-49, dist. airway engr., Hamilton. 1949 to date, asst. supt. constrn., air services branch, Ottawa, Ont.

References: H. J. Connolly, F. C. Jewett, G. L. McGee, E. M. Proctor, W. B. Redfern, W. L. McFaul, J. A. Wilson, G. R. Connor.

SULCS—VILIS MARTINS, of Montreal, Que. Born at Birini, Latvia, July 30, 1907. Educ.: Civil Engr., Univ. of Latvia, Riga, 1943; 1932-33, (summers) constrn. of railway, Dept. of State Highways & Rly., Riga; constrn. and repair work, Dept. of Highways; 1934-35, work mgr., constrn. reinforced concrete, V. Berzins, contractor; 1935-42, sr. constructor, designing of transformer and switch stns., war-time power stn. in reinforced concrete, etc., Municipal Utilities Dept., Riga; 1943-44, chief of designing dept., designing of wide span warehouses, sawmills, bridge and anti-aircraft towers, etc., O. Kese & Co., Riga; 1944-45, asst. to bldg. manager, Siemens-Halsce works, Berlin, 1945-46, engr., bldgs. repair and mtce., UNRRA camps; 1946-47, forman 3rd Constabulary Brigade Engr. APOISA on bldg. work; 1947-48, forman with builder, Th. Hermanowicz on rebuilding work; at present dftsman., Stadler, Hurter & Co., Montreal, Que.

References: A. T. Hurter, I. Kursbatt, P. Bastien, F. M. Kraus.

SULLIVAN—DAVID MURDOCH, of Shawinigan Falls, Que. Born at St. Stephen, N.B., April 25, 1917. Educ.: B.Sc., (Forestry Engrg.), Laval, 1942; 1941, (summer), field engr., Abitibi Pulp & Paper; 1942-43, asst. supt., logging, Singer Mfg. Co.; 1943-45, Flight Engr., RCAF; 1946, engr. supt., road constrn., J. MacLaren Co.; 1947, supt., road paving, Atlas Construction Co.; Shawinigan Engineering Co., Ltd., Shawinigan Falls, Que., 1948-49, quantity engr., at present asst. to supt. of field engrg.

References: G. Rinfret, R. Chambers, R. A. Parsons, J. A. Burke, H. K. Wyman.

TROUNCE—PETER CRANBROOK, of Sarnia, Ont. Born at Worthing, Eng., Jan 27, 1923. Educ.: B.Sc., (Eng.), London Univ., 1942; Graduate, Royal Aero. Society; R.P.E. Ontario: 1942-45. tech. asst., development work on engine components, D. Napier & Son, Acton, London, Eng.; 1945-46, sr. tech. asst., research dept. of aircraft propeller mfgrs., stress, vibration, etc., Rotol Ltd., Gloucester, Eng.; 1946-48, asst. mech. develop't. engr., machinery for rubber and plastic cable making, British Insulated Callenders Cables Ltd., Leigh, Eng.; 1948, design engr., development of water heaters, washing machines, etc., John Inglis Co., Toronto, Ont.; at present, project engr., engaged in initiating, estimating cost of, arranging dftng. of and supervising constrn. of new plant and modifications to existing plant, Polymer Corporation, Sarnia, Ont.

References: A. E. C. Slater, G. E. Elford, P. Cochrane, F. F. Walsh.

WEBER—ALEXANDER W., of Edmonton, Alta. Born at Sedgewick, Alta., May 14, 1921. Educ.: B.Sc., (Civil), Alberta, 1948; 1944-45-46, (summers), Topographer, instru'man., soil technician; with Dept. Public Works, Province of Alberta, as follows: 1947 (7 mos.), i/c gov't. road bldg. camp as res. engr., i/c of two gravel crushing contracts, 1948, res. engr., supervising base course & paving constrn. contract, 1949 to date, res. engr., supervising constrn. of substructure of bridge over Bow River at Cluny, Alta.

References I. F. Morrison, L. A. Thorssen, R. M. Hardy, A. M. Paull, G. R. Pinchbeck, L. H. McManus.

WHITE—DENIS WILLIAM GEORGE, of Quebec City, Que. Born at Forest Gate, Eng., June 17, 1923. Educ. Essex Tech. College, 1939-44; Borough Polytechnic, London, 1944; Graduate, Inst. Mech. Engrs., London; 1938-43, toolmaker's apprent.; 1943-44, dftsman., designer, Plessey Co., Ltd., Ilford, Eng.; 1944-48, jr. metallurgist, Steel Co. of Canada, Hamilton, Ont.; at present, metallurgist, Canadian Armament Design & Experimental Establishment, Quebec, Que.

References: P. Gagnon, C. B. Bate, B. O. Baker, J. W. MacNaughton, J. A. Lefebvre.

WICKS—SIDNEY GEORGE, of Winnipeg, Man. Born at North Portal, Sask., Dec. 19, 1912. Educ.: B.Sc., (Elect.), Manitoba, 1936; 1940-45, Royal Canadian Signals, with rank of Captain; with Univ. of Manitoba, 1945-48, Lecturer, Elect. Engrg., 1948 to date, Asst. Professor, Department of Electrical Engineering.

References: E. P. Fetherstonhaugh, N. M. Hall, A. E. Macdonald, R. Noonan, G. H. Herriot.

For Transfer from the class of Junior

ADAMSON—WILLIAM BLACKWOOD, of Fort William, Ont. Born in Scotland on Dec. 3, 1913. Educ.: B.Sc. (Elect.), Alberta, 1938; 1938-39, rodman & instru'man, H.E.P.C., of Ont.; 1940-48, planner & methods supervisor, engaged in manufacture of aircraft & buses, Cdn Car & Foundry, Fort William; 1948, asst. to mech. supt. engaged in preventative mtce., Abitibi Power & Paper, Port Arthur Division. (St. 1937, Jr. 1946).

References: C. T. Anderson, P. M. Rebin, J. I. Carmichael.

BRUCE—GORDON WYNDHAM, of Ottawa. Born at Calgary, Alta., on Dec. 13, 1918. Educ.: B.Sc. (Civil), New Brunswick, 1941; summers, Armstrong Brothers, Construction Co., Perth, N.B.; 1941-46, 5th Cdn. Armoured Regiment (overseas) 1946-48, transferred to R.C.E.M.E.; 1946-48, at RCEME School on course as instructor; 1948-49, director of mech. engrg.; at present, Major Deputy Asst. Director of Mech. Engrg. (Training), Ottawa. (St. 1941, Jr. 1946).

References: E. O. Turner, J. R. Dunlop, K. H. McKibbon, C. R. Boehm, W. S. Hunt, D. C. Smiley.

LOCKWOOD—ROBERT ORVILLE, of Winnipeg, Man. Born at Davidson, Sask., on July 18, 1920. Educ.: B.Sc. (Mech.), Sask. 1942, summer 1941, ordnance mechanical engrg. school, Kingston, Ont.; 1942-46, R.C.E.M.E. including three years active service with 1st Cdn. Div., rank of Captain; experience included field artillery repair, automotive mtce. and repair, 2 mos. course "B" motor vehicles at London, Ont.; 2 mos. course fire control instruments & ordnance gun mounts, Military College of Science, Stoke-on-Trent, England; 1946-47, training course on industrial equipment, relative to the lubrication problems, McColl Frontenac Oil Co. Ltd.; at present lubrication engr. contacting users of industrial & automotive equipment, McColl Frontenac. (Jr. 1946).

References: J. S. Neil, N. B. Hutcheon, L. J. Treleaven, C. Farstad, I. M. Fraser, T. D. Stanley, R. H. Wray.

ROLET—JEAN PAUL, of Quebec. Born at Quebec on July 15, 1918. Educ.: B.A.Sc. (Mi.), Laval, 1942; M.Sc., Columbia Univ., New York, 1946-47; R.P.E., Que.; summers, 1939, Noranda Mines Ltd.; 1940, Beattie Mines Ltd.; 1941, Quebec Highway Dept.; 1942-43, resident engr. Quebec Highway Dept.; 1943-46, field engr., Quebec Dept. of Mines; 1944, Charge Decours (mathematics), Faculty of Arts, Laval Univ.; 1946 to date, chief, technical information division, Quebec Dept. of Mines. (Jr. 1945)

References: A. O. Dufresne, L. Dufresne, G. Piette, P. Vincent, P. A. Dupuis, R. Desjardins.

RULE—PETER LEITCH, of Calgary, Alta. Born at Edmonton on Jan. 21, 1913. Educ. B.Sc. Arch. Univ. of Alberta, 1939; 1941-43, inspecting officer. Inspection Board United Kingdom, Ottawa; 1943, practicing architect, Rule Wynn & Rule, Edmonton, Alta.; the following projects were designed by this office: Taylor, Pearson & Carson warehouse & office bldg.; reinforced flat slab concrete, main floor steel frame, upper floors; Holy Cross Hospital, New Wing, five storeys, reinforced concrete frame; Consolidated Fruit Co., Warehouse & office bldg., Calgary; Power Plant at Vermillion for Cdn. Utilities; Greyhound Bus Depot & Garage, Edmonton; Distillery at Calgary, steel frame & reinforced concrete; Greyhound Bus Garage; St. Mary's Hospital, Trochu, New Wing. (Jr. 1943).

References: R. M. Hardy, I. F. Morrison, E. Avery, J. F. Langston, L. A. Thorssen.

WALLINGFORD—VIVIAN MILES of Forestville, Que. Born at Timmins, Ont. on Feb. 27, 1914. Educ.: B.A.Sc. (Civil), Toronto, 1944; R.P.E., Que.; 1940, leveller & topographer, H.E.P.C. of Ont.; Aug. to Nov./40, instru'man. & field engr. Chemical Constrn. Corp., Niagara Falls, Ont.; 1941-42, field engr. i/c field layout, supervision of labourers, carpenters, riggers, Welland Chem. Works, Niagara Falls; 1942-43, attending university, 3rd year; 1943, field engr. & dftsman, Can. Kellogg Co., Sarnia; 1943-44, attending Univ. of Toronto, (graduation); 1944, i/c one unit of precise levelling party Northern Alberta for Geodetic Service of Canada, Ottawa; 1944-45, chief of precise levelling party, Northern Ont. (same employer); 1945 to date, field engr. i/c studies, surveys for civil engrg. works, required in opening up timber limit, estimates for above; resident engr. on townsite constrn.; asst. to woods supt; asst. to development engr., mechanized logging, Anglo-Canadian Pulp & Paper Mills Ltd. (Jr. 1944).

References: J. O'Halloran, R. F. Legget, R. H. Farnsworth, C. E. Morrison, M. W. Huggins, R. Savary.

WEINSTEIN—SAUL ARNOLD, of Prince Albert, Sask. Born at Winnipeg on April 13, 1920. Educ.: B.Eng. (Mech.), McGill, 1944; 1941-42, production—Supt. Leeder's Ltd.; Winnipeg; 1944-46, RCEME Army Workshop Officer; 1946-47, mgr. Sask. Box Factory, Prince Albert; 1947-48, industrial engr. officer of chief industrial executive, Province of Sask. Government; 1948 industrial engr. Sask. Lake and Forest Products; at present engaged in planning, constrn. of High Utilization Mill (Sawmill), consulting engr. to the Board of Directors, controlling the Sask. Fish Board, Sask. Timber Board & Sask. Box Factory. (St. 1943, Jr. 1946).

References: J. A. Coote, N. Bubbis, W. D. Smith, M. Bubbis, R. I. Brasloff, A. L. Cole, A. I. Bereskin.

For Transfer from the class of Affiliate to Member

MURCHISON—JAMES GRAY of Fort William. Born at Aberdeenshire, Scotland, on Feb. 25, 1902. Educ.: one year, Aberdeen University; R.P.E., Ontario; 1930-1938, chainman, rodman, levelman, instru'man, Ont. Dept. of Highways; 1939-46, dftsman. field man, C. D. Howe & Co. Ltd., Port Arthur; 1941, full charge of construction of Internment Camp at Angler, Ont.; 1946 to date, town planning consultant in private practice. (Affiliate 1941).

References: J. M. Fleming, J. S. Galbraith, G. H. Burbridge, A. E. K. Bunnell, S. Young, S. T. McCavour.

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CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 1210-V.

ELECTRICAL

ENGINEER, electronics field, with considerable experience on inspection methods and organization. Salary $3,480 to $4,080 depending on qualifications. Position in Ottawa. Apply to File No. 1204-V.

MECHANICAL

MECHANICAL ENGINEER. Must be bilingual required to assist with the manufacturing of development and testing of prototype work of precision equipment. Salary open. Apply to File No. 1208-V.

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicants should state age, experience and salary expected. Apply to File No. 1210-V.

MISCELLANEOUS

MECHANICAL OR CIVIL ENGINEER under 40 years of age for responsible supervisory position in the Engineering Department of a large industrial plant. Should have 10 years experience in design, construction and supervisory positions in heavy industry. Excellent opportunity for the man with the right qualifications. Salary open. Apply to File No. 1200-V.

MECHANICAL OR ELECTRICAL ENGINEER required in Montreal. Preferably three to four years plant maintenance and new construction experience. Salary open. Apply to File No. 1201-V.

GRADUATE ENGINEER preferably mechanical or chemical required for sales engineering in the Toronto area. Should have some experience in sales and maintenance engineering. Salary open. Apply to File No. 1203-V.

ENGINEER, not over thirty-five years of age required by Canadian owned public utility operating in Bolivia. Must have at least 6 years experience in this field. Salary open. Apply to File No. 1205-V.

SALES ENGINEER required as Eastern Canadian Representative for an American firm. Applicant should be around 35 years of age preferably with a mechanical engineering degree. A few years experience in selling industrial rubber goods would be an advantage. Territory Port Arthur to the Coast. Salary open. Apply to File No. 1207-V.

CHEMICAL OR MECHANICAL ENGINEER required as assistant to manager of engineering and production department. Position located in Montreal. Salary open. Apply to File No. 1208-V.

GRADUATE ENGINEER required as Chief Engineer. Applicant should have knowledge of various types of earth moving machinery also basic engineering principles of construction. A knowledge of Maritime Marshland problems would be an advantage. Salary open. Apply to File No. 1209-V.

SALES ENGINEERS required by large chemical manufacturer. Applicants should have a chemical background and some sales experience. These positions offer a wide scope in products sold, fields covered and opportunity of advancement. Location Montreal and southern Ontario. Salary open. Apply to File No. 1211-V.

GRADUATE ENGINEER with experience in the manufacture of large industrial metal doors and in general sheet metal work required in Toronto to set up small plant. Salary open. Apply to File No. 1212-V.

ASSISTANT CHIEF ENGINEER required for Public Utilities Commission, Victoria, B.C. Candidates must be registered Professional Engineers in B.C. with at least ten years experience as a civil engineer or in an allied field, preferably in construction and operation of electric utilities and experience in public utility rate-making. Salary $4,884 rising to $5,484 per annum. Apply to File No. 1213-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CIVIL

GRADUATE CIVIL ENGINEER with some experience in structural steel required by firm engaged in the manufacture and sale of pre-fabricated steel structures. One man needed for liaison and co-ordinating the work between fabricators and design engineers and one for visiting clients in Quebec, with headquarters in Toronto. Salary depends on ability and experience with a minimum of $350.00. Apply to File No. 1168-V.

CIVIL ENGINEERS required by large organization with headquarters in Toronto. To take charge of design and construction of small timber and concrete dams and maintenance and operation of locks and dams etc., throughout the Province of Ontario. Applicant must have at least several years experience on construction of timber and concrete dams with sluiceways etc. Salary can be arranged to meet qualifications. Apply to File No. 1187-V.

CIVIL OR AGRICULTURAL ENGINEER required in Farm Structures Division of an agricultural college in Ontario. Applicant would be in charge of teaching the degree students in the fourth year course, also two year associate farm course as well as research and demonstrations related to this field of work. Salary open. Apply to File No. 1195-V.

ELECTRICAL

ELECTRICAL ENGINEERS with at least five years practical experience in layout and erection high tension and low tension overhead lines on wood poles. Experience in transformer maintenance and repair, sub station switchgear maintenance and erection, would be an advantage. Required by Bahamas Government Electrical Department, Nassau. Salary open. Apply to File No. 1180-V.

ELECTRONIC ENGINEERS 23 to 35 years of age required for design and development of radar type electronic equipment and mechanical design. Previous experience on similar type of work desirable. Location Nova Scotia. Salary $3,000 to $5,000 depending on qualifications. Apply to File No. 1189-V.

MECHANICAL

MECHANICAL ENGINEER required to take over complete operation of machine shop, foundry and pattern shop in Province of Quebec. Must be bilingual. Salary open. Apply to File No. 1169-V.

SENIOR MECHANICAL DRAUGHTSMAN, thoroughly experienced in machine design with some background and knowledge of material handling equipment. Salary open. Apply to File No. 1171-V.

MECHANICAL ENGINEERS with at least five years practical experience in the operation and maintenance of four cycle diesel-alternators in sizes up to 2,500 H.P. required by Bahamas Government Electrical Department, Nassau. Salary open. Apply to File No. 1180-V.

MECHANICAL ENGINEER required for design, estimating and sales of various mechanical equipment, such as, internal combustion engine driven generator sets, water purification and pumping plants, industrial and contractors equipment. Position located in Ontario. Salary open. Apply to File No. 1192-V.

MECHANICAL ENGINEER experienced in product design and production methods, must be familiar with all engineering problems relative to manufacturing of metal products. Age 35-45. Required for manufacturing plant located near Montreal. Salary open. Apply to File No. 1198-V.

MISCELLANEOUS

GRADUATE ENGINEER, preferably with mechanical background and sales experience required by large well known firm as Representative for a Distributor of pneumatic material handling equipment. Principal contacts will be in cement, heavy chemical, food, pulp and paper, brewing and aluminum industries. Salary open. Apply to File No. 1158-V.

AERODYNAMICIST capable of carrying out performance and stability calculations for initial design. Permanent position with good prospects, in Montreal area. Salary open. Apply to File No. 1159-V.

PROFESSOR AND CHAIRMAN of the Dept. of Electrical Engineering required by University of Manitoba. Position becomes vacant September 1st, 1949. Salary will depend on candidates's qualifications. Apply to File No. 1162-V.

CHIEF DESIGN ENGINEER, capable of taking care of and being responsible for all drawing office work in a modern West Coast pulp and paper mill. Applicant must have a minimum of five years responsible design practice in pulp and paper work. Salary open. Apply to File No. 1164-V.

SALES ENGINEER, mechanical background, required in Montreal. Must have knowledge of heating, ventilating and pumps. Salary open. Apply to File No. 1165-V.

GRADUATE ENGINEER preferably electrical or mechanical background required by large industrial plant as maintenance engineer. Duties include responsibilities of all maintenance work, also setting up and maintaining lubrication and inspection schedules. Salary open. Apply to File No. 1167-V.

SALES ENGINEER required for the Montreal district to represent a reputable conveyor company manufacturing in the Province of Ontario. Conveyor experience is desirable but not strictly necessary but engineering background essential. Remuneration would be on a commission basis with excellent possibilities. Apply to File No. 1172-V.

MUNICIPAL ENGINEER required by Town of Fort Erie, Ontario. Reply giving full particulars as to age, education, qualifications, experience and remuneration. Apply to File No. 1179-V.

ASSISTANT ENGINEER for Provincial Government — West Coast. Duties include taking charge of maintenance and construction work on forest or park road projects, designing simple bridges and other structures, making reports and recommendation on allied engineering problems in connection with Forest Service projects. Must have several years practical experience. Salary $3504 rising to $4104 per annum. Apply to File No. 1181-V.

GRADUATE ENGINEER with Technical and practical experience in concrete field required by large transit mixed concrete business in Montreal. Work would be under supervision of consulting engineer and applicant would be required to work as a liaison officer between company to its consumers. Salary open. Apply to File No. 1182-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges, required by a steel company in Southern Ontario. Salary open. Apply to File No. 1184-V.

TOWN ENGINEER required for town in the Maritimes. Duties include all work connected with streets, water supply and distribution, building inspecting, etc. Salary open. Apply to File No. 1193-V.

SALES ENGINEER with knowledge of chemistry desirable wanted by Canadian branch of American firm for industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate engineer and Canadian citizen. Location Ontario. Age between 30 and 40 years. Salary open. Apply to File No. 1196-V.

JUNIOR SALES ENGINEER wanted by Canadian branch of American firm for industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate engineer and Canadian citizen. Salary open. Location Ontario. Apply to File No. 1197-V.

CONSTRUCTION ENGINEER for housing development. Must be experienced at layout and have knowledge of prefabrication. Salary open. Apply to File No. 1199-V.

CONSTRUCTION SUPERINTENDENT capable of supervising housing project. Must be familiar with all phases of prefabrication. State previous experience. Salary open. Apply to File No. 1199-V.

Situations Wanted

REG. PROF.ENG. in Provinces of Ontario and Quebec, M.E.I.C., fully employed desires part time consulting and design work in field of factory modernization including conveyorization, ventilation, heating, compressed air, production methods, jig and fixture design. Has various experience in mechanical, aeronautical and furniture fields. Apply to File No. 140-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., age 43, desires spare time work. Twenty-one years experience in construction, both field and office, also plant maintenance covering design, supervision and surveying. Would like design or draughting work in evenings with surveying on week-ends. Apply to File No. 225-W.

MECHANICAL ENGINEER, age 39, experienced in tool design and production methods, material selection, production records, control and co-ordination. Desires employment preferably in Montreal with either manufacturer or firm of Engineers who could utilize all or a part of above experience. Apply to File No. 551-W.

CHEMICAL ENGINEERING GRADUATE M.E.I.C., McGill, 1938, age 35. My experience has included Laboratory work, production, chemical plant operation and costing, industrial development surveys, raw material supply planning, purchasing materials for plant construction and operating. Apply to File No. 1947-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., University of Sask. 1940, age 32, married. Continuous employment in engineering field since graduation. Experience includes design office and field work on construction, structural and mechanical plant engineering, maintenance and project engineering, production control, cost estimating and control. Seeking responsible position with future, preferably in Montreal area (Home). Available shortly. Apply to File 2219-W.

MISTER EXECUTIVE does your enterprize require an intelligent, cooperative, and widely experienced young engineer for the broader aspects of planning and running a business? A note to the file below will put you in touch with a 37 year old married McGill graduate engineer M.E.I.C. He has spent 6 years in industry, 4 years in R.C.A.F. aeronautical engineering, and over 4 years in business consulting involving scientific management, industrial relations, sales, organization, etc. Present salary is over $6,000.00. An interview will convince you. Apply to File No. 2228-W.

MECHANICAL INDUSTRIAL ENGINEER, Jr.E.I.C., leaving for Europe in near future. Will undertake missions of technical or other nature. Research, executive, service or sales works. Bilingual, age 27, good appearance, broad experience. Apply to File No. 2338-W.

CIVIL ENGINEER, M.E.I.C., Prof. Eng. (Ont.) Queen's B.Sc. Mechanical background. 3 years general plant and machine shop experience. 6 months railway maintenance. 8 months railway and general construction. 8 months R.C.E. 17 months design engineer of pulp and paper mill also in charge of construction and plant layout. Presently employed as assistant chief engineer in Woodlands Division of eastern pulp and paper mill with full responsibility of all roads, bridge and building construction. Available 1 month's notice. Location immaterial. Apply to File No. 2553-W.

CIVIL AND MECHANICAL ENGINEER, 28, married. Experience in construction and industry in surveying, structural design, construction supervision, motion study, production cost control, vibration control, clay processing, maintenance supervision, pulverizers and dust collectors, boiler installations, etc. Available on short notice for new assignments anywhere. Apply to File No. 2746-W.

INDUSTRIAL MECHANICAL ENGINEER, Jr.E.I.C., P.Eng. Ont., B.A.Sc. Married, age 29. Desires position requiring more responsibility and initiative in paper, lumber or allied industry or consulting industrial firm preferably on west coast or southern Ontario. Officer veteran. Experience in production control, cost analyses, plant and production layouts, work simplification, materials handling, motion and time study, incentive systems. Now completing Business Methods course. Apply to File No. 2794-W.

CHEMICAL - METALLURGICAL ENGINEER, M.E.I.C., McGill. Age 43. Eighteen years experience, in process development and operation, covering ore beneficiation (metallic and non-metallic), ferrous metallurgy, inorganic chemical processing. Positions held largely management. Familiar with determining suitable plant location and layout, equipment design and specification, process simplification, control and operation. Desires connection with progressive firm as manager of promising venture. Presently engaged. Minimum salary $6,000. Apply to File No. 2331-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44, 7 years industrial experience, production supervision, planning, scheduling, specifications, incentive systems, methods, estimating, cost analysis, business experience, welding application and metallurgy, manufacture of equipment for chemical production industry. Desire position technical representative, sales, executive assistant, production manager. Available 3 to 4 weeks. Apply to File No. 2920-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc., Queens, age 32, married, veteran, navy engineer officer, experience primarily includes heating and power plant design, estimating, construction, and maintenance. At present employed but desires change to responsible position in Ontario, British Columbia or Alberta. Apply to File No. 3020-W.

RESEARCH PROBLEM WANTED: Three students working for degree of Master of Chemical Engineering who will be working in Montreal this summer on experimental portions of their thesis desire an additional problem in Applied Unit Operations to be completed on a co-operative basis to help finance studies. Apply to File No. 3049-W.

GRADUATE ENGINEER, M.E.I.C., P.Eng., B.A.Sc., Toronto, married, age 31. Desires employment as assistant to construction or municipal engineer or would consider position on engineering staff of manufacturing company. 4 years army engineer officer, 4½ years experience in construction, surveying, layout and mining. Presently located in Toronto. Apply to File No. 3077-W.

MECHANICAL ENGINEER, Jr.E.I.C., Jr.A.S.M.E., P.Eng. (Ont.), B.Sc. Queens '47, married. At present completing work at Yale University towards master of engineering degree. Broad basic experience. Desires appropriate position, preferably in design. Available immediately. Apply to File No. 3111-W.

MECHANICAL ENGINEER, S.E.I.C., P.Eng. Ont., Toronto '48, married, family, age 35. 7 years drafting, shop experience. 1 year design engineer, in pulp and paper line and heavy industrial equipment. Interested in plant engineering or design, desires permanent position with responsibility. Apply to File No. 3180-W.

ELECTRICAL ENGINEER, Mar. '44. Jr.E.I.C. Technical Officer in Army 2½ years. Industrial experience 2½ years. Courses completed in Business Administration. Desires position as Executive Assistant or in Management Research field. Apply to File No. 3181-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., wants permanent position. Univ. of N.B. '49. Veteran R.C.A.F., navigator, married, 3 children. Position preferences are with a consulting engineer or some company doing inspecting and supervising work on construction. Apply to File No. 3182-W.

CHEMICAL ENGINEER, S.E.I.C., (Laval '49), B.A.Sc., P.Eng. Age 23, Single. Experienced in woodcutting operations, galvanizing mill, coal carbonization, recovery and refining of coal by-products. Desirous of obtaining a position with an engineering consulting firm dealing with chemical engineering problems (e.g. chemical plants, installation of heating systems, air conditioning etc.). Would also consider engineering work with a well established company, preferably in the Province of Quebec. Available immediately. Apply to File No. 3183-W.

RECENT GRADUATE, S.E.I.C., single, age 24, veteran. Now completing post-graduate study in Mechanical Engineering at Princeton University. Objective of this post-graduate work has been to develop as thorough a background as possible for manufacturing and industrial administration. At present working on thesis in quality control. Interested in any type of opening. Apply to File No. 3186-W.

STUDENT, S.E.I.C., '49 graduate, desires a position with the Petroleum Industry. Experience includes survey work, petroleum sales, drilling and testing oil wells. and radar technician with the R.C.A.F. In excellent health, 26 years of age, married. Apply to File No. 3187-W.

MECHANICAL AND ELECTRICAL ENGINEER, M.Sc., A.M.I.E.E., married, age 30. Also holds honours degree in physics and has good knowledge of mathematics. Desires position where these qualifications would be of value, probably in development, design or research and preferably in the field of mechanical engineering. Experience includes five years in the technical branch of the R.A.F. and eighteen months as mechanical engineer in large industrial concern. Apply to File No. 3188-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C. U.N.B. '49. Veteran, age 27, married, 2 children. 4 years with R.C.A.F. signals radar, summer 1948 with National Research Council in microwave laboratory. Entering McGill September 1949 for post-graduate work in communications. Desires position in or near Montreal for summer. Good references available. Apply to File No. 3190-W.

GRADUATE U.N.B. 1949 in Electrical Engineering anxious to secure a position in Ontario or Eastern Canada. Three years experience as a wireless electrical mechanic in the R.C.A.F. and one summer as an installer of dial phone equipment, also one summer with a power and paper company. Have also a complete commercial diploma. Position desired preferably with a Power Company or an auxiliary of such. Apply to File No. 3196-W.

CHEMICAL ENGINEER, S.E.I.C., B.Sc. '44, M.Sc. '45, Queen's, Ph.D. from Cornell University, Ithaca, N.Y., expected this summer, desires position in research or development in the chemical industry. Age 27, married. Good background in physical and inorganic chemistry, 1½ years experience in research and development department of abrasive company working on process and product improvement. Available September 1st. Apply to File No. 3197-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Ontario, University of Manitoba '41. 32 years of age, single. Experience in construction airport buildings and sewer and water, 1½ years in aircraft inspection and instructor of inspectors, surveying for water power sites, 2 years in design of reinforced concrete and steel structures. Desire position with consulting engineer, in industry, or in municipal field. Available on short notice. Apply to File No. 3198-W.

PROFESSIONAL ENGINEER, Jr.E.I.C., B.Sc. Eng. Age 34 years with 10 years engineering experience in plant operation, maintenance, design, construction and buying in the mining, rubber and petroleum refinery fields. 5 years previous diversified experience. Wishes to join the Purchasing Department of a reliable firm which is considering the employment of engineers in that department. Apply to File No. 3199-W.

MECHANICAL GRADUATE, aged 24, Jr.E.I.C., P.Eng. Q., Queen's 1947. Two years experience as a Manitenance Engineer with large Montreal industrial firm. Engaged in general plant and machinery maintenance work, including co-ordination of the work of draftsmen, machinists and other trades. Evening student in Commerce Courses. Navy veteran. Desires same type of work with another large or small Montreal industrial firm. Apply to File No. 3208-W.

GRADUATE ELECTRICAL ENGINEER, S.E.I.C., U.N.B. '49, age 22. Single. Experience limited to three summers in both preliminiary and construction surveys for Highways, and one with Canal Service Interested in Power Installation and development. Would consider employment abroad. Apply to File No. 3209-W.

MECHANICAL GRADUATE, Grad. I.M.E., Cambridge University, single, age 26. 3 years shop apprentice in English plants, 3 years Engineer Officer Royal Navy, running and maintenance of steam turbine and reciprocating machinery. Now special apprentice machinist in U.S. Desires junior production position in Ontario. Apply to File No. 3210-W.

CIVIL ENGINEERING STUDENT, S.E.I.C. Toronto. Veteran, age 27. Primarily interested in structural steel or reinforced concrete design but will consider anything. Available immediately. Apply to File No. 3211-W.

CIVIL ENGINEER, Student Member I.C.E., B.Sc. (Hons.) (London), ex-R.E.M.E. Captain, fluent French, Spanish, German, experience England, Switzerland, Spain, France, Egypt. At present working in Paris, seeks post as European representative of Canadian plant manufacturer. Willing to work first with firm in Canada to learn products. Apply to File No. 3215-W.

CIVIL ENGINEER, S.E.I.C., B.Sc. Alberta (1949). Age 30. Married, veteran. Desires employment in town planning and municipal field. Experience in surveying. Available on reasonable notice to present employer. Apply to File No. 3223-W.

MECHANICAL ENGINEER, B.Sc., Grad. I.M.E., 2 years Engineer Officer; one year steam turbine research. Anxious to obtain suitable position in Canada in research, design or teaching fields. Expecting to be in Canada around September 1949. Apply to File No. 3229-W.

CIVIL ENGINEER, S.E.I.C., B.Sc., C.E., University of Manitoba, 1948. Age 23. Two summers, on field construction. One year on the construction of a reinforced concrete grain elevator and malting plant; one year on small structures. One summer drafting and detailing concrete reinforcing. Employed as Reinforced Concrete Designer and Estimator. Desire a position with consulting engineering firm or combined engineering and architectural company to design and to do construction estimating. Available shortly after notification. Apply to File No. 3230-W.

CIVIL ENGINEER, M.E.I.C., interested in obtaining spare time employment. Four years experience in reinforced concrete and steel constructions covering design, supervision and surveying. Available evenings and week-ends. Presently located in Montreal. Apply to File No. 3232-W.

Partner Wanted

PARTNER, wanted by engineer with 25 years experience, contemplating private practice. Must have necessary qualifications; previous experience with consulting engineer desirable. Apply to File No. 2642-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., age 33, 11 years engineering experience in mining, all types surveying, airport and highway construction, building construction, sewage and water works office administration and mechanical experience in pulp and paper industry for past 3 years. Would like to contact parties or company interested in consulting engineering or construction with view to partnership, junior or otherwise. Wanted location in west, preferably Edmonton. Apply to File No. 2792-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

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Additions to the Institute Library
Reviews — Book Notes — Abstracts

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS. PAPERS:

Automatic Control of Battery Charging Equipment, *R. A. Harvey.*

Examines the automatic control of stand-by batteries in which trickle charge or floating methods are normally employed. Outlines the question of voltage regulation with batteries.

Development of Q-Meter Methods of Impedance Measurement, *A. J. Biggs and J. E. Houldin.*

Classifies instruments into low-impedance and high-impedance injection types. An instrument based on a novel principle of high-impedance injection has been developed and illustrations of the use for various classes of measurement are given.

Overhead Line Regulations, *H. W. Grimmitt.*

Discusses regulations relating to the design and practice of overhead line construction. Gives history of the Electricity Commissioners' Overhead Line Regulations, and the author's views on what would constitute a good code of regulations.

Tidal Power and the Severn Barrage, *H. Headland.*

Discusses recommendations for development of a single basin scheme and a plant capacity of 800 MW. Technical and economic factors delay development.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

A. C. S. R. Rural Lines; Catalog of Cable and Accessories:

Aluminum Company of America, Pittsburg, 1946. 151 p., illus., leather.

A. R. R. L. Antenna Book, 5th ed, 1949:

American Radio Relay League, West Hartford, Conn., 1949. 288 p., illus., paper.

Bibliography on Water and Sewage Analysis:

B. H. Weil and others. Atlanta, Ga., Georgia Institute of Technology State Engineering Experiment Station, 1948. 215 p., illus., fabrikoid. (Georgia Institute of Technology State Engineering Experiment Station Special Report No. 28).

Building for Modern Man; a Symposium:

Princeton University Press, Princeton, N. J.; Toronto, Saunders, 1949. 219 p., cloth.

Diesel Engine Design:

T. D. Walshaw. London, Newnes, 1949. 415 p., illus., cloth.

Dynamic Principles of Mechanics:

D. R. Inglis. Philadelphia, Toronto, Blakiston, 1949. 174 p., illus., cloth.

Electric and Magnetic Fields, 3d ed:

S. S. Attwood. New York, Wiley; London, Chapman and Hall, 1949. 475 p., illus., cloth.

Electric-Lamp Industry; Technological Change and Economic Development from 1800 to 1947:

A. A. Bright, Jr. New York, Toronto, Macmillan, 1949. 526 p., illus., cloth.

Electric Power Industry; Past, Present, and Future:

McGraw-Hill, New York, 1949. 590 p., illus., paper. (Electrical World, vol. 131, no. 21, May 21, 1949).

Electrical Transmission of Power and Signals:

E. W. Kimbark. New York, Wiley; London, Chapman and Hall, 1949. 461 p., illus., cloth.

Electron Tubes:

A. N. Goldsmith, A. F. Van Dyck, and other, editors. Princeton, N. J., Radio Corporation of America, 1949. 2 vols., illus., cloth.

Family Housing:

D. G. Carter and K. H. Hinchcliff. New York, Wiley; London, Chapman and Hall, 1949. 265 p., illus., cloth.

Foundations of Modern Physics, 2d ed:

T. B. Brown. New York, Wiley; London, Chapman and Hall, 1949. 391 p., illus., cloth.

How to Keep Invention Records, together with an Explanation of the Nature of Industrial Property:

H. A. Toulmin. Dayton, Ohio, Research Press, 1948. 78 p., illus., cloth.

Industrial Survey of the Resources of the Province of Manitoba, 1947:

Donald, Ross and Company. Winnipeg, Industrial Development Board, 1947. 179 p., illus., cloth.

Kinematics of Machines; an Elementary Text-Book, 2d ed:

R. J. Durley. New York, Wiley 1915, 397 p., illus., cloth.

Lecture Series in Nuclear Physics:

E. M. McMillan, E. Segre, and others. Washington, Atomic Energy Commission, 1947. 132 p., illus., paper.

Mathematics of Circuit Analysis; Extensions to the Mathematical Training of Electrical Engineers:

E. A. Guillemin. New York, Wiley; London, Chapman and Hall, 1949. 590 p., illus., cloth. (Massachusetts Institute of Technology Principles of Electrical Engineering Series).

Mnemonic Notation for Engineering Formulæ:

Sciences Committee of the Concrete Institute. London, Spon, 1918. 116 p., illus., cloth.

Patent Law for the Executive and Engineer, 2d ed:

H. A. Toulmin, Jr. Dayton, Ohio. Research Press, 1948. 231 p., illus., cloth.

Plant Production Control, 2d ed:

C. A. Koepke. New York, Wiley; London, Chapman and Hall, 1949. 568 p., illus., cloth.

Principles of Industrial Organization, 6th ed:

D. S. Kimball and D. S. Kimball, Jr. New York, Toronto, London, McGraw-Hill, 1947. 531 p., illus., cloth.

Process Engineering:

W. H. Schutt. New York, Toronto, London, McGraw-Hill, 1948. 308 p., illus., cloth.

Properties of Soft Solders and Soldered Joints:

J. McKeown. London, British Non-Ferrous Metals Research Association, 1948. 118 p., illus., cloth.

Research in Canada; Planning for the Coming Years; Papers given at the Symposium of the Chemical Institute of Canada, Quebec City, June 1945:

Chemical Institute of Canada. Toronto, Imperial Oil, 1946. 160 p., cloth.

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Be specific

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A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

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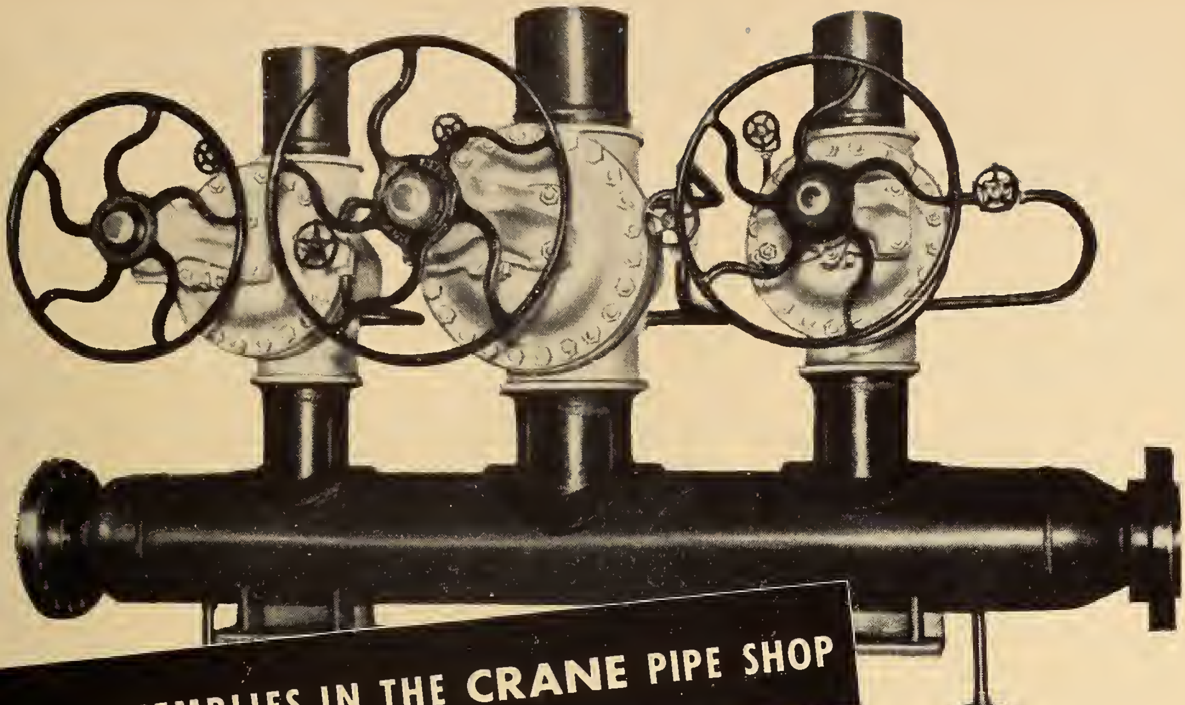

Route Surveying, 3d ed:

G. W. Pickels. New York, Wiley; London, Chapman and Hall, 1949. 434 p., illus., cloth.

Rural Planning and Development; a Study of Rural Conditions and Problems in Canada:

Thomas Adams for the Commission of Conservation. Ottawa, King's Printer, 1917. 281 p., illus., cloth.

Statique Appliquée et Résistance des Matériaux, Vol. 1—Systêmes Isostatiques; Calcul des Efforts; Déformations Elastiques; Problèmes de Stabilité; Cables:

F. Stussi. Paris, Dunod, 1949. 338 p., illus., cloth.

Steel and its Heat Treatment, Vol. 3—Engineering and Special-Purpose Steels, 5th ed:

D. K. Bullens and the Metallurgical Staff of the Battelle Memorial Institute. New York, Wiley; London, Chapman and Hall, 1949. 606 p., illus., cloth.

Streamline Flow; an Introduction to the Mechanics of Viscous Flow, Film Lubrication, the Flow of Heat by Conduction, and Heat Transfer by Convection:

H. F. P. Purday. London, Constable, 1949. 185 p., illus., cloth.

Tables of Inverse Hyperbolic Functions:

Harvard University Computation Laboratory, Cambridge, Mass., 1949. 290 p., cloth.

Textbook of Wood Technology, Vol. 1—Structure, Identification, Defects, and Uses of the Commercial Woods of the United States:

H. P. Brown, A. J. Panshin, C. C. Forsaith. New York, Toronto, London, MaGraw-Hill, 1949. 652 p., illus., cloth.

Thermodynamic Charts for Combustion Processes:

H. C. Hottel, G. C. Williams, C. N. Satterfield. New York, Wiley; London, Chapman and Hall, 1949. 2 vols., illus., cloth.

Two Lectures: Present Situation in the Theory of Elementary Particles; Electron Theory of Superconductivity:

W. Heisenberg. Cambridge, Mass., Cambridge University Press; Toronto, Macmillan, 1949. 51 p., illus., cloth.

Wear; as Applied Particularly to Cylinders and Piston Rings:

F. P. Bundy, T. E. Eagan, R. L. Boyer. Mount Vernon, Ohio, Cooper-Bessemer Corp., 1948. 129 p., illus., cloth.

Welding Metallurgy: Iron and Steel, 2d ed:

O. H. Henry and G. E. Claussen, revised by G. E. Linnert. New York, American Welding Society, 1949. 505 p., illus., fabrikoid.

TECHNICAL BULLETINS, ETC.

American Society for Testing Materials. Special Technical Publications:

No. 83—Symposium on Mineral Aggregates (1948).

Engineering Institute of Canada. Technical Papers:

No. 1—Flow in Conduits and Canals, R. DeL. French and F. M. Wood.

Engineering Societies Library. Bibliographies:

No. 3—Bibliography on Precision Investment Casting by the Lost Wax Process.

Harvard University. Graduate School of Engineering. Publications:

No. 455—Two-Dimensional Transonic Flow Patterns, Stefan Bergman.—No. 460—Regularity Domains of Solutions of Linear Partial Differential Equations in Terms of the Series Development of the Solution, B. M. Ingersoll.—No. 461—On Tables for the Determination of Transonic Flow Patterns, Stefan Bergman.

Institute of Metals. Reprints:

Elastic Properties of Metallic Alloys, R. Cabarat, L. Guillet, R. LeRoux.—Measurements on the Oxidation-Resistance of High-Melting Point Alloys, O. Kubaschewski and A. Schneider.—Non-Metallic Inclusions in Magnesium-Base Alloys and the Flux-Refining Process, E. F. Emley.—Oxidation-Resistance and some Phase Relationships in the System Chromium Tantalum-Nickel, O. Kubaschewski and H. Speidel.

International Civil Aviation Organization. Publications:

Collected Airport Tariff Scales (Circular 9-AT/2).—Final Report of the Communications Division (Doc 6625-COM/521).—Final Report of the Operations Division (Doc 6640-OPS$567).

Princeton University. Industrial Relations Section. Selected References:

No. 27—Current Legislative Proposals To Amend the Social Security Act.

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No. 11—Electrical Equipment of the Swedish State Shipbuilding Experimental Tank, Karl Tiselius.

U. S. Bureau of Standards. Handbooks:

No. 41—Medical X-Ray Protection up to Two Million Volts.

U. S. Highway Research Board. Bibliographies:

No. 5—Classified Subject and Author Index of the Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering.

...Bulletins:

No. 17—Highway Planning.—No. 18—Land Acquisition and Control of Highway Access and Adjacent Areas.

University of Connecticut. Engineering Experiment Station. Publications:

No. 4—Summary of Heat Absorption Rates for an Experimental Ground Coil System, C. H. Coogan, Jr.

STANDARDS, SPECIFICATIONS, ETC.

American Institute of Electrical Engineers. Publications:

No. 550-May 1949—Master Test Code for Resistance Measurement.—No. 600—May 1949—Recommended Specification for Speed-Governing of Steam Turbines intended to Drive Electric Generators Rated 500 kw and up.—Nos. 601 and 602-May 1949—Preferred Standards for Large 3600-Rpm 3-Phase 60-Cycle Condensing Steam Turbine-Generators (Larger than 10,000-kw Rated Capacity), and Standard Specification Data for Generators for Large 3600-Rpm 3-Phase 60-Cycle Condensing Steam Turbine-Generators (Larger than 10,000-kw Rated Capacity).

American Standards Association. Standards:

C37.6-1949—American Standard Schedules of Preferred Ratings for Power Circuit Breakers.

American Welding Society. Standards:

A3.0-49—Standard Welding Terms and Their Definitions.—A3.1-49—Standard Master Chart of Welding Processes and Process Charts.

British Standards Institution. Codes of Practice:

CP(B)848—Gas Cooking Installations (Schools).—CP(B)852—Terrazzo Flooring.

Canadian Standards Association. Specifications:

CSA E13-1949—Railway Wire-Fencing and Gates, 2d ed.

Edison Electric Institute. Publications:

EEI Pub. No. R-6-May 1949—EEI-NEMA Preferred Voltage Ratings for A-C Systems and Equipment.

National Electrical Manufacturers Association. Publications:

NEMA Pub. No. 117-May 1949—EEI-NEMA Preferred Voltage Ratings for A-C Systems and Equipment.

PAMPHLETS, ETC.

At Your Service:

Canadian Chamber of Commerce, Montreal, 1949.

Bibliography on X-Ray Stress Analysis with Subject Index:

St. John X-Ray Laboratory, Califon, N. J., 1949.

Careers in Engineering and Science:

Polytechnic Institute of Brooklyn, Brooklyn, N. Y., 1949.

Head-End Horsepower: Salzberg Memorial Lecture, Syracuse University, April 26, 1949:

L. K. Sillcox, New York, 1949.

Locomotive Wheel Balancing:

G. W. McArd. Manchester, Emmott, 1949. (Mechanical World Monograph No. 44).

Memorandum on the Use of Aluminium and Zinc Base Alloys for Electric Conduit Installations:

Institution of Electrical Engineers, London, 1949.

Nationally Recognized Standards in State Laws and Local Ordinances; a Presentation of the Problem and Possible Solutions:

American Standards Association, New York, 1949.

Proceedings of the 1948 Civilian Soil Mechanics Conference:

Associate Committee on Soil and Snow Mechanics of the National Research Council of Canada, Ottawa, King's Printer, 1949. (N.R.C. Technical Memorandum No. 11).

Professional Engineers' Act:

Corporation of Professional Engineers of Quebec, Montreal, 1949.

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F. Cyril James. Montreal, McGill University, 1949.

Selling Technical Books at Retail:

Margaret Specht. New York, American Book Publishers Council, 1949.

Telling the Story of Engineering Research:

Engineering College Research Council of the American Society for Engineering Education. Iowa City, Iowa, State University of Iowa, 1949.

Two New Methods for Testing Triaxial Specimens:

Georges Welter. (Reprinted from the Welding Journal Research Supplement, November 1948).

What We have Learned in a Year; Presented at Yale University, May 17, 1949:

L. K. Sillcox, New York, 1949.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

AERONAUTICAL QUARTERLY:

Royal Aeronautical Society, London. vol. 1, no. 1, May 1949. 10/3– per issue to non-members, 7/9– to members.

The purpose of this new periodical, is to publish papers describing new and original work or papers reviewing the progress in some specialised field of activity in aeronautics. In this way it is hoped to make results of research available to all workers or design groups concerned with aviation.

BRITISH STANDARDS INSTITUTION. STANDARDS:

B.S. 1306:1948, Part 2—Seamless Copper Tubes with Plain and Screwed Ends for Steam Services. *2/–.*

Deals with tubes up to 8 inches nominal diameter for steam, feed, blow-down and similar boiler services. Gives requirements relating to the composition of the copper, the selection of test samples, and testing.

BS 1461-63:1948—Chromium-Molybdenum Steel Castings. *2/–.*

Includes specifications for general engineering purposes in which the castings will normally be operating at temperatures in excess of 400° C.

BS 1470:1948—Wrought Aluminium and Aluminium Alloys. Sheet and Strip. *3/6.*

The first part contains the clauses relating to chemical composition, conditions in which the material is available and mechanical properties. The second part contains the general clauses applicable to all the materials.

BS 1486:1948—Part 1—Lubricating Nipples and Adaptors for Machinery and Vehicles. *2/6.* **Part 2—Heavy Duty Lubricating Nipples.** *2/–.*

Give the overall dimensions and thread sizes of those lubricating nipples and adaptors in general use for machinery and vehicles and for general industrial purposes Include provisions relating to materials, permissible variation in dimensions, nipple-mounting, centre distances and marking.

BS 1489:1948—Reels for Covered, Solid, Round, Electrical Winding Wire. *2/–.*

The object of this standard is to ensure interchangeability and reduce the wide range of sizes of reels.

CANADIAN MASTER TAX GUIDE, 4th ed, 1949:

CCH Canadian Ltd., Toronto, 1949. 222 p., illus., 9 x 6 in., paper, $3.00.

This volume is a guide for 1948 income tax returns and 1949 policy, based upon the Income Tax Act, the Income War Tax Act, and the Excise Tax Act, with amendments, regulations, decisions, and rulings issued to March 1st, 1949. A supplement issued after the presentation of the 1949 Budget is appended.

COMPANY-WIDE UNDERSTANDING OF INDUSTRIAL RELATIONS POLICIES; A STUDY IN COMMUNICATIONS:

Helen Baker. Princeton, N. J., Princeton University, 1948. 78 p., illus., 9¼ x 6 in., paper, $2.00. (Princeton University. Industrial Relations Section. Research Report Series No. 78).

The purpose of this study is to assist in the improvement of communications between management and employees. The subjects discussed are the methods used by companies to disseminate information regarding their policies; the ways in which they keep executives, supervisors, and employees informed; the influence of unions on company communications; difficulties encountered in gaining a wide understanding of industrial relations policies, and opinions as to best methods; and how to evaluate the effectiveness of policy communications.

DIRECTORY OF ENGINEERING DATA SOURCES: A GUIDE TO AMERICAN LITERATURE IN ENGINEERING AND RELATED SCIENCES:

Southeastern Research Institute, Atlanta, Ga., 1948. 63 p., 8½ x 5¾ in., paper.

This publication represents an attempt to bring to the attention of the individual engineer the great number of information sources available to him. This directory is offered simply to give the engineer clues as to where to begin his search for information. It is intended to supplement rather than to replace any existing devices.

HANDBOOK OF CULVERT AND DRAINAGE PRACTICE:

Armco Drainage and Metal Products of Canada, Ltd., Guelph, 1947. 478 p., illus., 7¼ x 4¾ in., fabrikoid, $3.00.

This handbook is intended as an aid in the solution of surface and subsurface drainage problems. Topics discussed are strength, durability, economy, hydrology and hydraulic capacity, surface drainage, subsurface drainage, special purpose drainage, and field installation instructions. Numerous tables are included.

INTRODUCTION TO ENGINEERING PROBLEMS:

R. Q. Brown. New York, Prentice Hall, 1948. 191 p., illus., 8¾ x 5¾ in., cloth, $3.95, U.S.

This book contains sections on the objectives of engineering problems, logarithms and the slide rule, basic mathematical and physical principles, good form in writing, and various engineering projects. The purpose of engineering problems is to train the student in good habits of work and study, and to establish a closer bond between the contents of courses in mathematics, physics, and applied mechanics, in order to determine whether or not the student has aptitude for engineering.

PHYSICS FOR ARTS AND SCIENCES:

L. G. Hector, H. S. Lein, C. E. Scouten. Philadelphia, Toronto; Blakiston, 1948. 731 p., illus., 8¾ x 6 in., cloth, $5.50.

This text is written for beginners. Included in the general field of mechanics are the behaviour of ordinary material objects, also the subjects of heat and temperature, the behaviour of sound, and many molecular phenomena. In electricity are included the ordinary behaviour of electricity and also the subjects of magnetism and light. Light is shown to be electrical in nature, but the geometric optics associated with practical applications are also given. The general subject of nuclear physics in presented.

PRACTICAL APPLICATION OF STANDARD COSTS:

F. R. Goodey. Manchester, Emmott, 1948. 53 p., illus., 6½ x 4 in., paper, 2/6–. (Mechanical World Monograph No. 43).

This pamphlet presents chapters on the cost survey; the process layout; works control—fabrication and assembly work; material charges, direct and indirect; wages payments; excesses and indirects; and preparing the selling price. Many charts and figures are given.

PRACTICAL RESIDENTIAL WIRING:

J. F. Nowak. New York, Toronto, London; Van Nostrand, 1948. 495 p., illus., 9¼ x 6¼ in., cloth, $5.95 in Canada.

The primary objective of this book is to present the safe, practical methods that should be employed in small-house electrical wiring and household electrical repairs. Reference is made throughout the book to the National Electrical Code of 1947, as the authority, where safe practices are given. Review questions and problems are appended to each chapter. A glossary of electrical terms is included, as well as National Electrical Code tables.

TECHNICAL DESCRIPTIVE GEOMETRY:

W. E. Street. New York, Toronto, London, Van Nostrand, 1948. 179 p., illus., 9¾ x 7 in., cloth, $3.25 in Canada.

This treatise affords a draftman's method of treatment to obtain size, shape, and position of every detail of machines and structures. The illustrations and problems are arranged in progressive order —first, straight orthographic projection; second, primary auxiliary projection; and third, successive auxiliary projection. These are followed by chapters illustrating the practical applications of revolutions, developments, intersections, perspective, shades and shadows, and vector diagrams.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

A.S.T.M. STANDARDS INCLUDING TENTATIVES, 1948 SUPPLEMENT.

Part I-A, Ferrous Metals, 261 pp.
Part I-B, Non-Ferrous Metals, 291 pp.
Part II, Nonmetallic Materials—Constructional, 279 pp.
Part III-A, Nonmetallic Materials—Fuels, Petroleum, Aromatic Hydrocarbons, Soaps, Water, Textiles, 409 pp.
Part III-B, Nonmetallic Materials—Electrical Insulation, Plastics, Rubber, Paper, Shipping, Containers, Adhesives, 330 pp.

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., *1948-1949. illus., diagrs., charts, tables, 9 x 6 in., paper, $4.00 each part, $20.00 per set.*

Divided into the same five sections as the recent previous editions, these volumes contain the revised standards and the new and revised tentatives that have been accepted since the appearance of the 1946 Book of Standards. Yellow stickers, accompanying the five volumes, are to be attached in the proper places in the 1946 books to direct certain changes in standards or to call attention to revisions. The standards appearing in this Supplement are indexed in the current, separately published Index to A. S. T. M. Standards. This general index also covers the 1946 volumes and the 1947 supplements.

FLUID MECHANICS.

R. C. Binder. 2 ed. Prentice-Hall, New York, 1949. 361 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.65.

The aim of this book is to present an introduction to the fundamental of fluid mechanics, keeping physical concepts and established quantitative relations in the foreground. Statics, kinematics and dynamics are considered, followed by discussions of viscosity, dimensional analysis, and dynamic similaritly. Instruments, hydraulic machinery, and particular cases of flow are then treated. Each chapter is followed by a list of selected references and numerous problems.

JET PROPULSION IN COMMERCIAL AIR TRANSPORTATION.

R. E. Hage. Princeton University Press, Princeton, New Jersey; Saunders, Toronto, 1948. 91 pp., diagrs., charts, maps, tables, 9 x 6¼ in., paper, $2.25 in Canada.

In dealing with this outstanding question, the author discusses the evolution of speed and its effect on commercial transportation, basic power-plant and aerodynamic characteristics, and the case for the turbojet commercial transport.

METAL WORKING AND HEAT-TREATMENT MANUAL, VOLUME III. SURFACE HARDENING PROCESSES.

F. Johnson. Paul Elek Publishers Ltd., Diamond House, 36-38 Hatton Garden, London, E.C.1, 1948. 185 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., 17s.6d.

Written primarily for the engineer and the student of engineering, this third volume of a four volume set considers metal surface hardening processes. Carburizing, cyaniding, nitriding, flame hardening and induction hardening are discussed in detail. Three methods of surface protection during heat treatment are described. Many tables and diagrams illustrate the text.

MOLYBDENUM, STEELS, IRONS, ALLOYS.

R. S. Archer, J. Z. Briggs and C. M. Loeb, Jr. Climax Molybdenum Company, New York, 1948. 391 pp., diagrs., charts, tables, 9¼ x 6 in., fabrikoid, limited free distribution.

This monograph deals with the properties of molybdenum and its uses in ferrous and nonferrous alloys. The fundamental effects of heat treatment on microstructure are considered as well as the addition of molybdenum to alloys. Each different alloy is considered individually. The appendices contain many useful charts. Each of the ten sections is followed by an extensive bibliography.

RAILWAY & OTHER STEAMERS.

C. L. D. Duckworth and G. E. Langmuir. Shipping Histories Ltd., 62 Vincent Street, Glasgow, C.2, 1948. 340 pp., illus., tables, 8½ x 5½ in., cloth, 30s.

Brief descriptions are given of the steamships operated by the various British railway companies and some continental companies (Belgian, Danish, etc.) from about 1840 to the present. Nearly 100 illustrations are included. The latter part of the book is devoted to a tabulation of the fleets, which are treated in accordance with their ownership prior to the nationalization of the British railways in January, 1948.

SOIL MECHANICS FOR CIVIL ENGINEERS.

B. H. Knight. Longmans, Green & Co., New York, Toronto; Edward Arnold & Co., London, 1948. 255 pp., 8¾ x 5½ in., cloth, 21/-. $5.25 in U.S.

The basic topics covered in this volume are the properties, sampling, testing and classification of soils, drainage and compaction, load stresses, and stabilization. Considerable emphasis is laid on the applications of soil mechanics to highway engineering problems. Complicated mathematical proofs are omitted. References to further study material are included.

TABLES OF PHYSICAL AND CHEMICAL CONSTANTS AND SOME MATHEMATICAL FUNCTIONS.

G. W. C. Kaye and T. H. Laby. 10th ed. Longmans, Green & Co., London, New York and Toronto, 1948. 194 pp., tables, 9¾ x 6¼ in., cloth, $6.00 in Canada.

This well-known publication aims to fill the need for an up-to-date moderately priced collection of physical and chemical tables which will be of use in teaching and in the laboratory. In the tenth edition, the general constants of physics and astronomy have been revised; the absolute value of gravity recalculated; and the section on optical glass has been rewritten and expanded.

TABLES OF SCATTERING FUNCTIONS FOR SPHERICAL PARTICLES.

U.S. Bureau of Standards, for sale by Superintendent of Documents, Government Printing Office, Washington, D.C. 1948, 119 pp., tables, 10¼ x 8 in., paper, 45 cents. (Applied Mathematics Series 4).

These tables of intensities, prepared by the Computation Laboratory of the National Applied Mathematics Laboratories, are based on the theory set forth by Gustav Mie. Intensity functions, noted in the introduction, give the angular distribution of intensity and the total light scattered by a small spherical particle as a function of a certain parameter. These factors can be used to determine particle size and concentration as explained in the introduction and by the use of the tables. An extension of the tables (pt. IV) provides values for a problem in the application of microwave radar.

TELEPHONY, a Detailed Exposition of the Telephone Exchange Systems of the British Post Office. Volume I. General Principles and Manual Exchange Systems.

J. Atkinson. Sir Isaac Pitman & Sons, Ltd., London, Toronto, 1948. 513 pp., illus., diagrs., charts, tables, 10 x 7 in., cloth, $9.00 in Canada.

Intended for those engaged in the installation and maintenance of telephone exchange equipment, this comprehensive work is primarily concerned with signalling and switching aspects of telephony. Volume I is devoted to general principles and manual exchange systems. Volume II, now in preparation, will deal with automatic exchange systems. A knowledge of elementary d-c and a-c theory is assumed. External plant practice and transmission have been omitted. Review questions are provided at the end of each chapter, and answers to numerical exercises are given. A classified bibliography is included.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

CONSTRUCTION IN REINFORCED CONCRETE, 2d ed:

G. P. Manning. Sir Isaac Pitman & Sons, London, W.C.2, 1947. 182 pp., illus., diagrs., charts, tables, 7½ x 5 in., cloth, 15s.

Intended for the use of students and designers, this book gives an elementary knowledge of the practical processes of construction in reinforced concrete. All phases of the preparation of concrete are discussed as well as detailed working instructions.

HYDROGEN IN METALS.

D. P. Smith. University of Chicago Press, Chicago, Ill., 1948. 367 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $10.00.

This monograph of the University of Chicago, Institute for the Study of Metals, deals with all the modes of absorption or retention of hydrogen by massive solid metals, and with the causes and direct consequences of such occlusion of hydrogen. The literature of these matters is fully assembled and collated and is considered in the light of numerous studies of the effects of occlusion on lattice parameters, on the diffusion of the lines of the X-ray spectrum, and on electrical resistance, magnetic susceptibility, and other properties. Almost 1,500 annotated references from the literature prior to 1947 are included.

PLANNING THE MODERN CITY.

H. M. Lewis. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 2 vols., illus., charts, maps, tables, 10½ x 7¾ in., cloth, Vol. 1, 284 pp., Vol. 2, 224 pp., $6.00 each.

Based on "The Planning of the Modern City" by Nelson P. Lewis, this book is designed for all concerned with the over-all pattern, growth and development of their community. Following a presentation of introductory material, the author discusses transportation, port development, highway and street planning. Planning patterns for land use are then considered. Community planning and re-planning are treated, and the rise of special planning problems is thoroughly investigated. The final part is devoted to legal, economic and administrative problems. Selected references and questions follow each chapter.

POWER FROM THE WIND.

P. C. Putnam. D. Van Nostrand Company, Toronto, New York and London, 1948. 224 pp., illus., diagrs., charts, maps, tables, 9½ x 6 in., cloth, $6.00.

Of interest to those investigating new sources of power, this is the record of the wind-turbine experiment conducted in Vermont by a group of eminent scientists and engineers. The purpose of the work was to find out the possibilities of generating electricity on a large scale by harnessing the wind. The book summarizes the various technical problems encountered, the attempts at solving them, and the findings and discoveries made.

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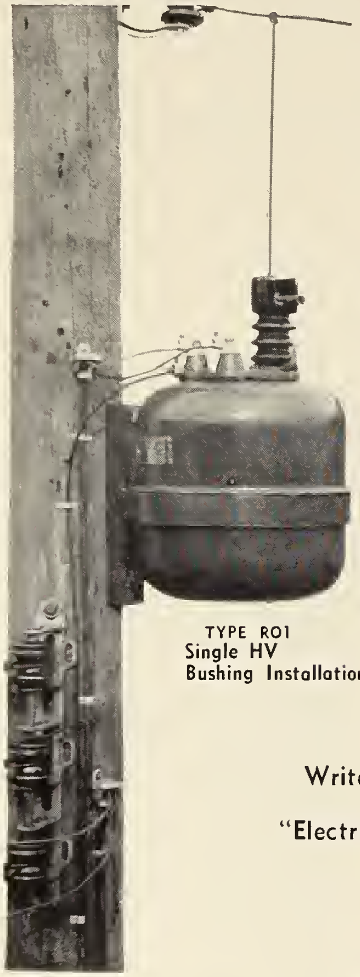

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603 BELMONT ST.,
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Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Burlington Steel Company Limited is now rolling HI-Bond Reinforcing Bars — the first to be rolled in Canada.

As the name implies, these bars are designed to have high bonding characteristics when imbedded in concrete. The manufacturer points out, that, since unit stresses vary directly with bond characteristics, higher bond values will allow higher unit stresses and consequent economies in steel. It is also claimed that the better anchorage will reduce the number of hook bends, thus reducing the cost of shop work and the placing of steel in the forms. Several other advantages are claimed.

•

Six new electrode holders for the Inert-Arc welding process have been announced by the Canadian General Electric Company. The holders are of two types, one for manual welding and the other for machine welding. The manual holders are available in 100, 200, 400 and 800 amp. ratings and those for machine welding in ratings of 400 and 800 amps. Additional information about these holders may be obtained from the Company. Ask at any C.G.E. office for publication GEA-5146.

•

A 2000 horsepower high temperature gas turbine has been harnessed by U.S. industry for the first time, it was reported recently by the Canadian Westinghouse Co. Ltd. The new type engine, built by the Westinghouse Electric Corporation, has been put into service by the Mississippi River Fuel Corporation on a six months experimental basis. It will be used to pump natural gas through the Corporation's lines from the Monroe, La., fields.

The turbine has already completed more than 1000 hours of successful tests at the Westinghouse South Philadelphia plant. The following claims for this new equipment are made by the manufacturer. "Turns out more power per pound of weight than any other industrial power plant. It requires the minimum of building and foundation and can be transported into remote, undeveloped, regions. It can be set up in a relatively short time. It needs no water for cooling, very little lubricating oil, and maintenance problems are practically eliminated because of the few moving parts". The turbine operates on fuel oil which is sprayed into compressed air and burned in a specially designed combustion chamber. Development of the turbine was facilitated by the production of metals capable of withstanding the very high temperatures at which it operates.

•

Fabrication of the much-discussed all-aluminum highway bridge, which will be erected at Arvida, Quebec, is now nearing completion at the Lachine plant of the Dominion Bridge Company Ltd.

Among the special problems encountered were those posed by the relatively high expansion coefficients of aluminum and by riveting techniques. Cold riveting with air riveting machines is being employed wherever possible, pneumatic riveting guns being used only where necessitated by space limitations.

•

The Inter-Ministerial Commission of the Italian Government has approved the details for an oil refinery to be erected in Milan, Italy. This new plant will be one of Italy's most important refineries and it will have an annual capacity of well over one million tons. It will be used to produce high-octane gasoline, white spirit, kerosene (for both illuminating and agricultural purposes), gasoil, diesel oil, and various types of fuel oil. The site of the refinery is in the immediate vicinity of recently discovered oil fields. The plant will receive its crude oil from Genoa by a 100 mile 10 inch pipeline. Arrangements for a terminal at Genoa have been completed and work on the pipeline and on the refinery is now in hand.

•

Alchem Limited is now operating a new plant at Burlington, Ontario. Built at a cost of half a million dollars, the plant was officially opened, on June 23, by Nelson Township's lady reeve, Mrs. Mary Pettit. It will be used for the formulation of a wide assortment of industrial water-treating chemicals.

•

Eco Engineering Company announces production of the new General Utility Close-Coupled Electric Motor-Driven Gearless Pump. Models available have ¼", ⅜", ½" and ¾" ports and are supplied with ¼, 1/3 and ½ horsepower motors. Complete details may be obtained from the manufacturer at 12 New York Avenue, Newark 1, N.J.

•

A new model 3030 New Holland Double Impeller Breaker, designed for primary crushing, has been placed in production by the New Holland Manufacturing Company, Mountville, Pa.

•

Increasing demands for soya products for home and industry are being met at the new processing plant of The Glidden Company, 5165 West Moffat Street, Chicago, Illinois. Illinois farms, which produce a vast amount of soybeans, will be one of the major sources of supply for raw materials used at the plant. The Company will extract oil from the soybeans with hexane. The oil will go into food products as well as paint and other non-edible products.

•

Canadian General Electric Company announce that the range of the type KSO single tank oil circuit breakers has been extended and now includes a 138,000 volt breaker. Performance was demonstrated at the G.E. high-power testing laboratory in Schenectady. This new circuit breaker is of Canadian design. It is a triple-pole single-throw 130 Kv-800 ampere unit with interrupting rating of 2,500,000 KVA with 5 cycle fault clearing time and 20 cycle reclosing.

The trip-free pneumatic operating mechanism is provided with its own motor-operated compressor and air storage tank. The housing is weatherproof and is equipped with thermostatically-controlled heaters. The control source can be either A.C. or D.C. Closing or opening operation requires only 10 amperes at 125 volts. The air storage tank provides for 5 or 6 breaker operations without replenishment. Assuming no breaker operations, the compressor motor operates only 15 minutes in a 24-hour period.

•

The first Canadian Company to receive a licence for production of a new type of ductile cast iron is Otaco Ltd., Orillia, Ont., it is announced by the International Nickel Co. of Canada Ltd.

It is claimed that this new engineering material has many properties not available in common castings. It was developed in the International Nickel Company's research laboratories. The new cast iron combines the process advantages of gray cast iron, such as fluidity, castability and machinability, and, according to the manufacturer, the product advantages of cast steel.

Licences to handle ductile cast iron have already been granted to a number of companies in the United States. The Canadian manufacturer will use the material in his own products which include wagons, trucks, farm implements, and log hauling equipment and will supply ductile castings to Canadian industries on order.

Chain Belt Company of Milwaukee announces the new Rex 4 in. Closed Diaphragm Pump, with a capacity rated at 6000 Gals. per hour with a 10 ft. suction lift.

The pump is of all-welded steel construction and weighs 440 lbs. For details communicate with the Company at 1600 West Bruce St., Milwaukee 4, Wisconsin.

The Winchester Repeating Arms Company, New Haven, Connecticut, is using a G.E. Magnetic Comparator for production-line checking of stock steel and small ferrous parts. It is stated that the checking rate is now 1000 units per hour.

A new smoke density indicator and control is available from Canadian General Electric's control division. Designed specially to indicate industrial smoke density levels, the equipment can be used also to control over-the-fire heated air to the fire-box. Additional information may be obtained from any of the Company's branch offices. Ask for bulletin GEA-5254.

"Sandwich" walls, consisting of a layer of "Foamglas" insulation held between two layers of concrete made in panel form will be used in the high-alpha cellulose pulp plant of Columbia Cellulose Company, Ltd., which is now under construction at Prince Rupert, B.C.

A new office and warehouse for Canadian General Electric Company Limited was opened on June 10th at Chicoutimi, Quebec. The building is of brick and cement block construction, one storey high, and has a floor area of 6000 square feet.

International Diesel Electric Company Inc., 13-02 — 44th Avenue, Long Island City 1, New York, has announced a new design of electro-magnet sweeper, powered by a gasoline engine generator set, with self-contained switchboard, both mounted on a 4-wheel trailer. These sweeper units are designed specifically for magnetically sweeping airport landing strips, roads, etc. of metal waste. The unit consists of a 4-cylinder, Gasoline engine driving a 7½ kw. d-c generator, the magnet operating at 115 volts, covers an area of 26" x 96". Specifications will be furnished by the manufacturer.

The Lindberg Engineering Company, 2444 W. Hubbard Street, Chicago, announce "Automatic ladling" a new development in removing molten aluminum from the melting furnace to the die casting machine. Design of the automatic ladling mechanism is an outgrowth of the development of a new two-chamber induction melting furnace manufactured by the same Company.

The American Paulin System, Los Angeles, California, announce the manufacture of a Micro Altimeter. Graduated in intervals of one foot over a range of 6,000 feet, it is claimed that the instrument is accurate to one foot and sensitive to altitude changes in inches. It weighs 4½ lbs. and is furnished in a well-designed carrying case.

Greyhound A.C. Arc Welder Corp., 606 Johnson Avenue, Brooklyn 6, N.Y., announce the manufacture of a completely portable and self-operating spot-welder which has been tested and approved by the Underwriters' Laboratories.

The welder weighs 23 pounds and is claimed to be sturdy enough for heavy duty industrial spot-welding. It is protected in a non-corrosive cast aluminum housing, and is recommended for on-the-spot welding jobs in hard-to-get-at places. Details may be obtained from the manufacturer.

Appointments and Transfers

The executive and general offices of Ross Engineering of Canada Limited are now located at 304 St. Patrick Street, Town of LaSalle, Montreal 32, Que. The telephone number is Wilbank 5185.

W. W. H. Dean has been appointed manager of the electronic apparatus division, engineering products department of RCA Victor Company Limited. He will be responsible for the merchandising and sale of radio aids to navigation, radar and communications equipment, scientific instruments, police, aircraft, and marine equipment and all government engineering products sales. Mr. Dean graduated from McGill University, in 1937, with a Bachelor of Engineering degree.

Lachapelle and Archambault Ltd., 4109 St. Catherine Street, West, Westmount, Montreal 6, Que., is a newly formed company which will act as manufacturers' representatives for the following lines: Fisher Governor Company, Continental Equipment Company, Helicoid Gage Div. of the American Chain and Cable Co. Inc., Magnetrol Inc., Trinity Equipment Company, G. A. L'Hoir Inc.

J. R. Duncan has been appointed boiler sales engineer of the Ontario division of the Dominion Bridge Company Limited. Before joining his present employer he was sales manager of the boiler and steam power division of John Inglis Company Ltd.

Chas. Warnock & Co. Limited have moved their Montreal office and concrete laboratory in Montreal to 31 St. James Street West. The telephone number is unchanged, Marquette 3777.

James G. Morrow, chairman of the Canadian Standards Association, has been elected president of the American Society for Testing Materials. The A.S.T.M., with laboratories and research buildings in Philadelphia, is the recognized international authority for United States' materials of all kinds. Mr. Morrow's election to his new office was made at the society's 52nd annual meeting which was held recently in Atlantic City. He is chief metallurgist of the Steel Company of Canada and has had a leading part in metallurgical and steel work on this continent since 1905.

F. D. MacNaughton

F. D. MacNaughton has been elected a director of Warden King Limited, Canadian Potteries Limited, and Port Hope Sanitary Manufacturing Company Limited. He is also a director of Crane Steelware Limited. Mr. MacNaughton is General Manager of Sales of Crane Limited and subsidiary companies.

On June 30th, Charles H. Mitchell, vice-president and manager of works of the Canadian Westinghouse Co. retired after 50 years of service.

Born in Enniskillen, near Toronto, Mr. Mitchell graduated from Bowmanville High School and entered the University of Toronto. He discontinued his studies at the University to enroll in the Westinghouse apprentice course at East Pittsburgh in 1899. In 1902 he was sent to the British Westinghouse Co. and served in Manchester as a foreman He returned to the United States in 1904 and in 1906 entered the service of the Canadian Westinghouse Company Ltd. After serving the Company in various capacities, and doing important war work in World War I, he was appointed works manager in 1938, and in 1940 was elected to a vice-presidency of the Company.

Alliance Electric Works Ltd. have moved their Toronto office from Wellington Street, to 600 Bay Street, Room 208. The telephone No. is WA. 1253.

J. T. Asquith has been appointed vice-president and general manager of the Canadian Car & Foundry Company. Mr. Asquith will make his headquarters at the head office of the Company in Montreal.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

"LinkBelt News" published by the Link-Belt Company, 307 North Michigan Avenue, Chicago 1, Illinois, will be sent to any Journal reader who requests a copy. Produced in newspaper style and printed on coated paper, the publication is attractive in appearance and most informative in content.

•

Mine Safety Appliances Company, Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa., offer a four-page brochure in which is described equipment whereby steel studs can be driven, with ease, into steel, masonry, or concrete. Ask for bulletin TA-17.

•

"Inco Triangle," published by the International Nickel Company of Canada, Limited, at Copper Cliff, Ontario, is a company house magazine, designed primarily for Company employees. Featured articles in the publication deal with some of the Company's technical and manufacturing achievements and processes. It is recommended as good semi-technical reading material. Copies may be obtained on request to the Company.

•

Hardinge Company, Inc., 240 Arch Street, York, Penna, has issued an 8-page bulletin describing a new type of automatic sampler. The literature describes, in detail, the operating mechanism of the sampler and it shows typical installation arrangements for both wet and dry processes. The sampler is particularly adapted to the mining, stone products, ceramics, chemical, and allied process industries.

•

In view of the large demand for Bulletin T/C 7, which was released in December, 1948, by Wheelco Instruments Company, 847 W. Harrison St., Chicago 7, Illinois, a second edition has been printed.

This 40 page data book contains descriptions, prices and recommendations for thermocouples, heat-eyes, lead wire, thermo-couple wire, heads, connectors, plug and socket assemblies, insulators, protecting tubes ,and essential information and curves for thermocouple selection. Please mention your Company and position when requesting a copy of this publication.

•

Surface Combustion Corporation, Toledo 1, Ohio, has just released a new bulletin on Gas-Fired Air Heaters and their applications. Ask for bulletin SC-143.

•

The tentative manual of practice "Uniform System of Accounts for Sewer Utilities" may be obtained from the Federation of Sewage Works Associations, 325 Illinois Building, Champaign, Illinois. This guide book adapts to sewer utilities the basic accounting system that has proved to be successful in the transportation, water works, and power utility fields.

Supplemented by an introduction to the general fundamentals of accounting and by appendices demonstrating practical applications to operation cost accounting and to sewer service rate-making, the manual will be useful to sewer utility executives and superintendents as well as to municipal accountants. The manual contains 117 pages. The charge per copy is $5.00.

•

The June issue of the "Bepco Journal" contains the following articles "More About Glass Bulb Mercury Arc Rectifiers"; "Measurement of Voltage on High Tension Systems without the Use of Potential Transformers"; "Harland Boiler Feed Pumps for High Pressures and Temperatures". If you would like to receive this publication on a regular basis apply to Bepco Canada Limited, 4018 St. Catherine St. West, Montreal 6, P.Q.

•

The type of information required by engineers and contractors for specification purposes in connection with Monel roofing sheet is supplied in condensed form in a brochure available from The International Nickel Company of Canada Limited, 25 King St. West, Toronto. Of special interest is the list of gauges suggested for Monel. They represent a

(*Continued on next page*)

reduction in gauges over those commonly specified. Ask for "Roofing Sheet Specifications".

•

A four-page folder, in which is described all models in the new Thor "Silver Line" Portable Electric Tools, may be obtained from the Independent Pneumatic Tool Company, Aurora, Illinois.

•

Tremco Mfg. Co. (Canada) Limited, 57 Bloor St. W., Toronto, offer a 32-page brochure "Solving Roof Problems". It is designed as "a summary for those responsible for the maintenance of buildings" and discusses the causes of, as well as the remedies for, roofing problems.

•

Russel-Hipwell Engines Limited, Owen Sound, Ont., have designed and developed a series of multiple engine units employing the Cummins "Dependable" Diesel engine. Ratings are up to 680 h.p. continuous, or 820 intermittent. These engine units are described in bulletin M.E.U.-1, copies of which will be forwarded on request.

•

Air Conditioning Engineering Company (Canada) Limited, 71 Vitre St. W., Montreal 1, Que., Canadian representatives of the Richmond Screw Anchor Co. Inc. of New York, offer copies of the 1949 Richmond catalogue. The catalogue is in the nature of an engineering guide to give the concrete contractor and form builder complete information on the use of Richmond equipment. The catalogue also contains data on limiting design values of wood forms and basic data for wood form design with charts for wale load, joist load, post load, etc.

•

Charles Bruning Co. Inc., 4754 Montrose Ave., Chicago 41, have issued bulletin A-1054 in which is described the "Perspect-O-Metric". This draughtsman's instrument has been developed to assist in the production of accurate perspective views.

•

Volume 8, No. 3, of "Wheelco Comments", a magazine produced by Wheelco Instruments Company, contains articles on four widely different types of temperature control applications. A description of the smallest continuous furnace at Ferro Enamel Corporation is followed by an explanation of the new turbine blade fatigue tester built by Baldwin Locomotive Company. A full page is devoted to a description of an injection molding machine, and there is a listing of the instruments in operation at the Metlox Manufacturing Company's pottery. The publication is produced quarterly. Copies may be obtained on application to the Company at 847 W. Harriman St., Chicago 7, Ill.

•

Peacock Bros., Town of Lasalle, Montreal, Que., Canadian agents for the Farval Corpn. of Cleveland, offer copies of a 4-page brochure "Studies in Centralized Lubrication".

•

Gaertner Scientific Corpn., 1201 Wrightwood Ave., Chicago 14, announce the publication of a new 16-page publication "Chronographs and Time Standards". The publication describes and illustrates tape chronographs, drum chronographs, electrically driven tuning forks, regulator clocks and accessories. Ask for bulletin No. 171-49.

•

Caterpillar Tractor Co., Peoria 8, Ill., have available copies of a 16-page, two-colour booklet covering the use of Caterpillar equipment in public works. The booklet contains specifications of the Company's equipment and it has been specially prepared for the attention of municipal and government officials. Ask for "Saving Tax Dollars with 'Caterpillar' Equipment". The number of the booklet is 12260.

•

The following data sheet may be obtained from the Bristol Company of Canada, Limited, 71 Duchess St., Toronto — "Bristol's Automatic Starch Conversion Control using the Bristol-Brookfield Viscometer" — 5 pages, bulletin 073-10-1: "A Method for Starting-up Reset Controlled Industrial Processes under Automatic Control" — 16 pages, bulletin A-104-1. These bulletins have been prepared and punched to facilitate binding in a ring binder.

•

Spielman Agencies Ltd., 420 Lagauchetiere St. W., Montreal 1, Que., have produced a single-sheet folder "The Waterproofing of Structures by Internal Renderings to Exclude Dampness". The bulletin is very concise and most informative. Ask for specification sheet No. 12-P.

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"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

* * *

CONTENTS

12,300 copies of this issue printed

COVER PICTURE

On this month's cover is an aerial photograph of the busy harbour of Montreal, frequently referred to as the "world's greatest inland seaport." The cross on top of Mount Royal is a landmark known to sailors throughout the world.

In the foreground of the photograph are the covered building-sheds, shops, floating dry-dock and fitting-out basin of Canadian Vickers Ltd. At top left are the Jacques Cartier and Victoria Bridges, which connect the island of Montreal with the "South Shore." At top centre is the principal business section of the City. It is anticipated that when the next census of the population of greater Montreal is taken, it will be in excess of one and one-quarter million persons.

Photo by Spartan Air Services Ltd., Ottawa.

The New BANK of MONTREAL Building in TORONTO

A paper prepared for publication in The Engineering Journal

THE STRUCTURE

by

J. Morrow Oxley, M.E.I.C.

Chapman, Oxley & Facey, Marani & Morris, Architects
Toronto

The Bank of Montreal Building in Toronto is designed to accommodate the main Toronto branch of the Bank, the offices of the assistant general manager and superintendent for Ontario and twelve floors of office space for tenants. The site is the north west corner of King and Bay Streets.

More than a century ago the first Toronto office of the Bank was on a portion of this site which it occupied until 1845. Construction of the new building was started in 1939, but had been carried only to grade with the steel frame to the third floor level when, seventeen days after the declaration of war, it was decided to suspend operations because of the anticipated need for manpower and materials and the Government's desire to conserve resources and avoid any capital expenditures not immediately essential to the war effort. Work was resumed on actual construction in 1946, but shortages in manpower and materials and the reduced efficiency of labour have resulted in much slower progress than would have been possible under pre-war conditions.

General Description

The building consists of sixteen storeys above grade, rising to a

Fig. 1. The Bank of Montreal building at King and Bay Streets, Toronto.

Describing the building generally, and its sub-foundation, this paper tells how a shut-down during war years made necessary certain changes in design. The structural design, insulation, glazing, roofing, elevators, and vaults are discussed in turn.

height of 231 ft., and three floors below grade with the lowest or boiler room floor at a depth of 39 ft. over a portion of the area. The cubic content above grade approaches very nearly the maximum permitted under the city zoning regulations.

The sub-soil conditions in this part of the city are very good for construction purposes, consisting generally of stiff blue or yellow clay, becoming stiffer with increasing depth, underlaid with shale having some thin laminations of clay, and finally sedimentary limestone at a depth of about thirty-three feet below grade. Excavation in rock was not necessary except for the boiler room, some of the elevator pits and trenching for plumbing lines. Excavation in the stiff clay could be on vertical lines to the required finished dimensions, except where the original soil had been disturbed previously.

After the long interruption due to the war, and on reconsideration of the whole problem, in the light of development of ideas by owner and architect, it was decided to make some substantial changes in the design. These consisted primarily of moving the four main elevators from about the middle of the east front to near the south west corner; making the principal set backs at the third floor level on the east and west faces instead of on the north and south; a second set back at the fourteenth floor; and a completely new architectural treatment of the facades. (Fig. 1)

The changes necessitated a redesign of many elements of the steel frame and footings, but nearly all of the original steel was economically usable. In addition to the steel in position on the site a large proportion of the column and heavy beam sections had been stored during the interval, as they were not economically adaptable to war requirements.

The exterior of the building is of Queenston limestone with a silver grey granite base about 8 ft. high. In the lower portion the ashlar facing is in courses up to 4 ft. high with alternate blocks 10 in. and 6 in. thick. In the upper portion the courses are 2 ft. 6 in. and 1 ft. 4 in., with thicknesses of 4 in. and 8 in. respectively. The heaviest blocks are the lintels over the main entrances, which run up to nearly 8 ft. long, 3 ft. $1\frac{1}{2}$ in. deep, and over 3 ft. thick, and weigh about $7\frac{1}{2}$ tons. The ashlar is backed up with brick to a total thickness of 2 ft. 6 in. in portions of the high first storey and 1 ft. 1 in. in the upper floors. Symbolic figures representative of the natural resources and industries of Canada are carved in the six big lintels over the main entrances on the King and the Bay Street fronts, and in the deep reveals at the sides of these entrances.

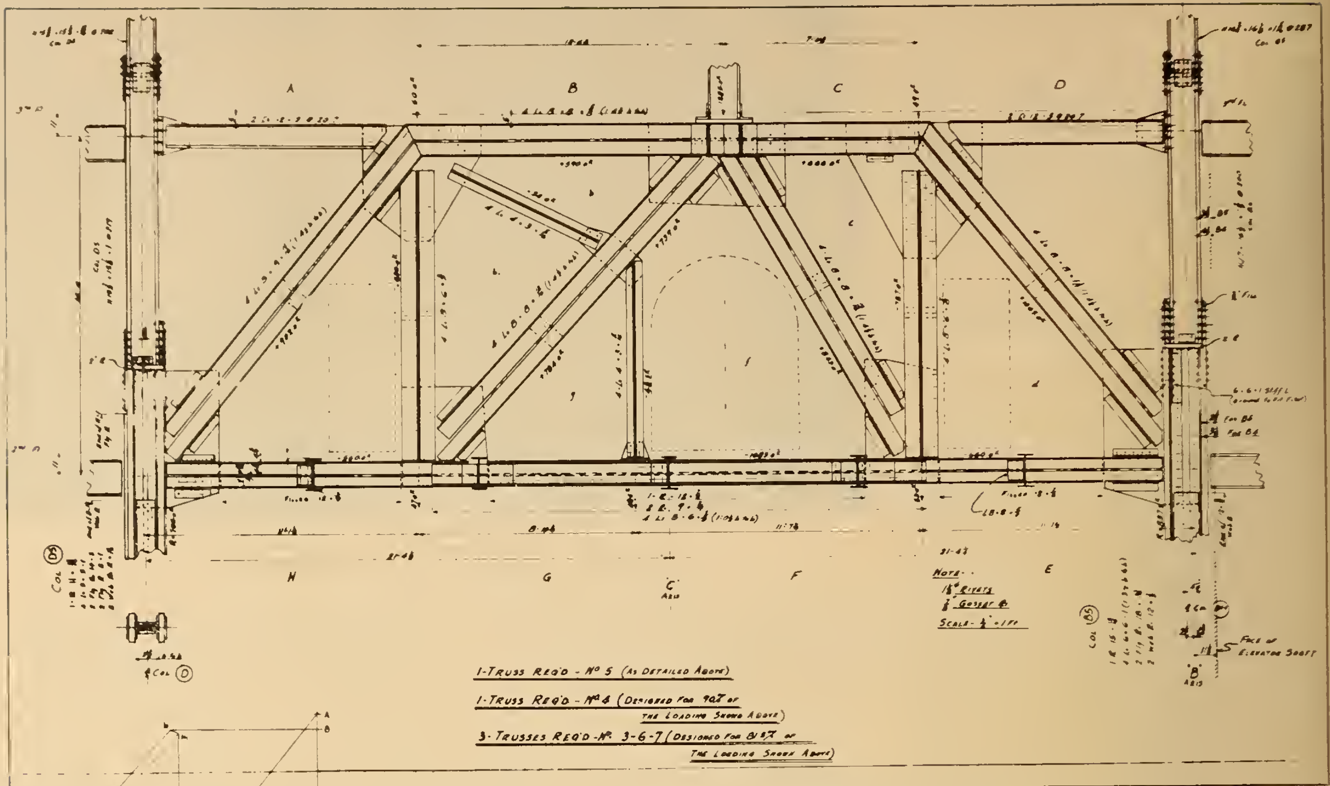
Fig. 2. Excavation, shoring, and underpinning for the foundations of the new building.

Structural Design

The principal structural elements consist of a riveted steel frame supported on steel slabs and grillages, in some cases resting directly on concrete footings on bed rock and in others on so-called caissons or concrete piers carried down to rock; reinforced concrete enclosing walls up to grade; walls of Queenston limestone above grade backed up with brick; floors and roofs of reinforced Haydite concrete joists carried on steel primary beams; partitions of terra cotta tile enclosing all stair and elevator wells and lavatories, and gypsum partitions for minor subdivisions. Open web steel joists were used in the mezzanine of the side aisles below the second floor, and for roof support in the pent houses to reduce dead load. No cantilever construction was required in the footings, as the foundation conditions were so good that it was possible to make the supports practically concentric with the loads in all cases. The design complied with the regulations of the Toronto Building By-Laws.

The structural steel design has no particularly unusual features except perhaps the two-storey trusses over the main banking room and the concentrated section of some columns designed to be enclosed with ornamental marble. The trusses (Fig. 3) have a span of 42 ft. $8\frac{1}{2}$ in., and in addition to the distributed loads of the 2nd and 3rd floors have a column load from above of 1285 Kips near the centre of the span. It was necessary to use $1\frac{1}{8}$ dia. rivets and $\frac{7}{8}$ in. gusset plates for the connections. One corridor and two doorways pass through the trusses, which are fire-proofed with 3 inch terra cotta tile on each side.

Except for the columns referred to above (Fig. 4) and a few other special cases all columns are of wide flange solid sections in two storey lengths, spliced by side plates at 1 ft. 6 in. above the floor line. There are some fairly heavy plate girders at the set backs, the maximum section consisting of a 40 in. by 15/16 in. web plate with flange angles 8 in. by 8 in. by $1\frac{1}{8}$ in. and flange plates 1 at 21 in. by 1 in. and 2 at 21 in. by $\frac{3}{4}$ in. Two double web cantilever girders are required at the second floor level, north end, to transfer column loads of about 800 kips from 1 ft. 1 in. inside the wall line to 3 ft. 0 in. inside. (Fig. 5)



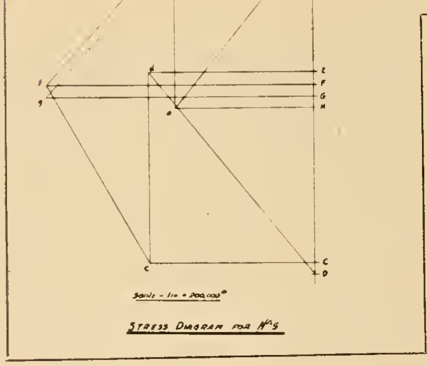


Fig. 3. The main trusses.

have sufficient shear value to sustain all wind loads. The distribution of shear and the moments produced in a typical bent are illustrated in Fig. 7.

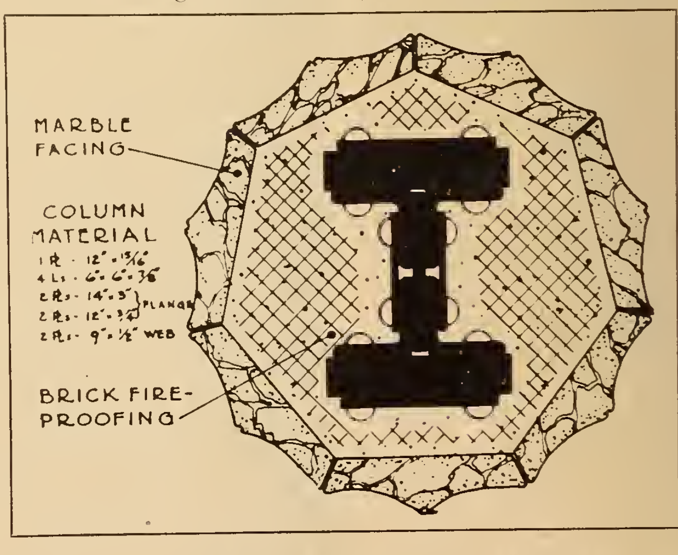
Floors above the first are of Haydite concrete joists with spans from 14 ft. to 27 ft., and effective depths from 8¾ in. to 12¾ in. The idea of using Haydite arose when it was found that the use of stone concrete in the new design would produce excessive loads on some of the columns and footings already in place. The Haydite concrete cost about $6,000 more than normal sand and crushed stone or gravel concrete, but the overall saving resulting from its use was about $70,000 due to reduction in tonnage of structural and reinforcing steel and minimizing of changes in the foundations, footings and steel structure. As the Haydite produced a very harsh mixture, pozzolith was added to improve workability.

Underfloor ducts for electrical services were provided in all office areas. Generally they consist of a three-duct system to serve power and light, telephone, telegraph and intercommunication requirements in continuous lines about six feet

Design for wind loads was based on the moment distribution method of allocating moments to columns and beams, on the assumption that points of contraflexure were at the mid height of columns, and moments proportionate to relative stiffness of the members. In spite of the irregular plan and location of columns the centre of gravity of applied loads so nearly coincided with that of the summation of joint stiffnesses that there was negligible eccentricity tending to torsion in the frame as a whole.

The height of the first floor (38 ft.) made it economical to place wind trusses in the mezzanine spaces in the side aisles, to reduce the effective free standing height of the columns and the moments on the connections. Typical beam to column connections are made with split wide flange beams and many of them require 1⅛ in. dia. rivets. Above the 8th floor masonry walls and permanent partitions

Fig. 4. Section of special columns.



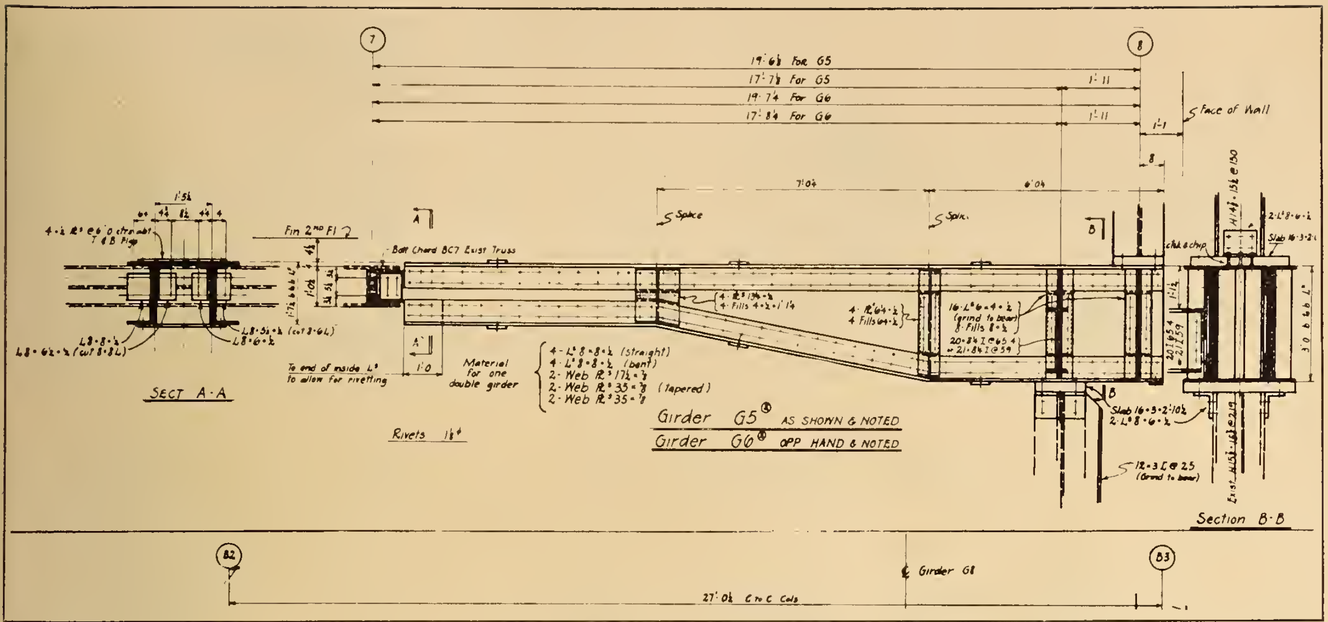


Fig. 5. Double cantilever girders.

apart. As compared with many designs the scheme used gave substantial savings in floor to ceiling depth, dead weight and cost. (Fig. 6)

Underpinning of adjacent buildings was necessary only on a portion of the west side, where a two storey and basement bank and office building had to be supported by concrete piers extending from their basement down to bedrock. This relatively old building had also to be braced across its width by temporary vertical beams and cross ties, but the whole operation was performed without any evident movement. (Fig. 2)

Wall Insulation, Glazing, Roofing

Wall insulation in general consists of a coating of asphalt sprayed on the interior brick and two thicknesses of crimped aluminum foil hung on cross bars in the furring to give three air spaces in addition to the heat reflective effect of the foil. In a few areas the conditions were met better by using two-inch compressed cork board. The building is glazed with double plate glass throughout and with a few exceptions the windows are not designed to be opened except for cleaning. For office floors Sull sash were used, and for the large windows in the Bank portion the Thermoglaze type.

All roofs are insulated with two inches of cork board or equivalent and, except for the promenade decks at the 3rd and 14th floor levels, are covered with five-ply felt and gravel, 20-year bonded roofing. The promenade decks have a surface consisting of two inches of concrete with integral colour, reinforced with mesh and divided into ten-foot squares with copper expansion joints surrounding each square and at junctions with walls and parapets. Flashings to roofing are of felt and plastic elastigum and flashings of coping and parapet walls are covered with 16 oz. copper carried down on the inside of parapets over the junction with the roof flashing.

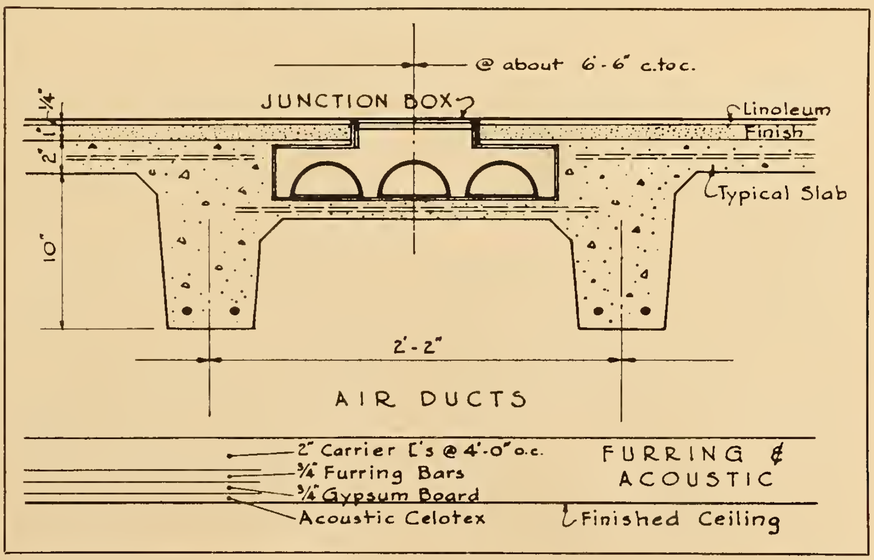
Elevators

There are seven elevators—four serving to the 15th floor, of which two go to the sub-basement; one serving executives, sub-basement to 5th floor; one for bank staff, sub-basement to 5th and one freight service, sub-basement to 2nd floor. The four high rise elevators with 5 ft. by 7 ft. car platforms have a speed of 700 ft. per min., and are of the signal control type, as is the executives car with a speed of 500 ft. per min. The other two have car switch control and a speed of 500 ft. per min.

Vaults

The main vaults are on two levels and are 59 ft. by 50 ft. in area. The security vault at the basement level, 15 ft. below the ground floor, has walls, roof and floor of very hard concrete, reinforced with heavy, closely spaced, interlaced bars of special steel. This vault is lined on floors, walls and ceiling with several layers of

Fig. 6. Section showing underfloor ducts.



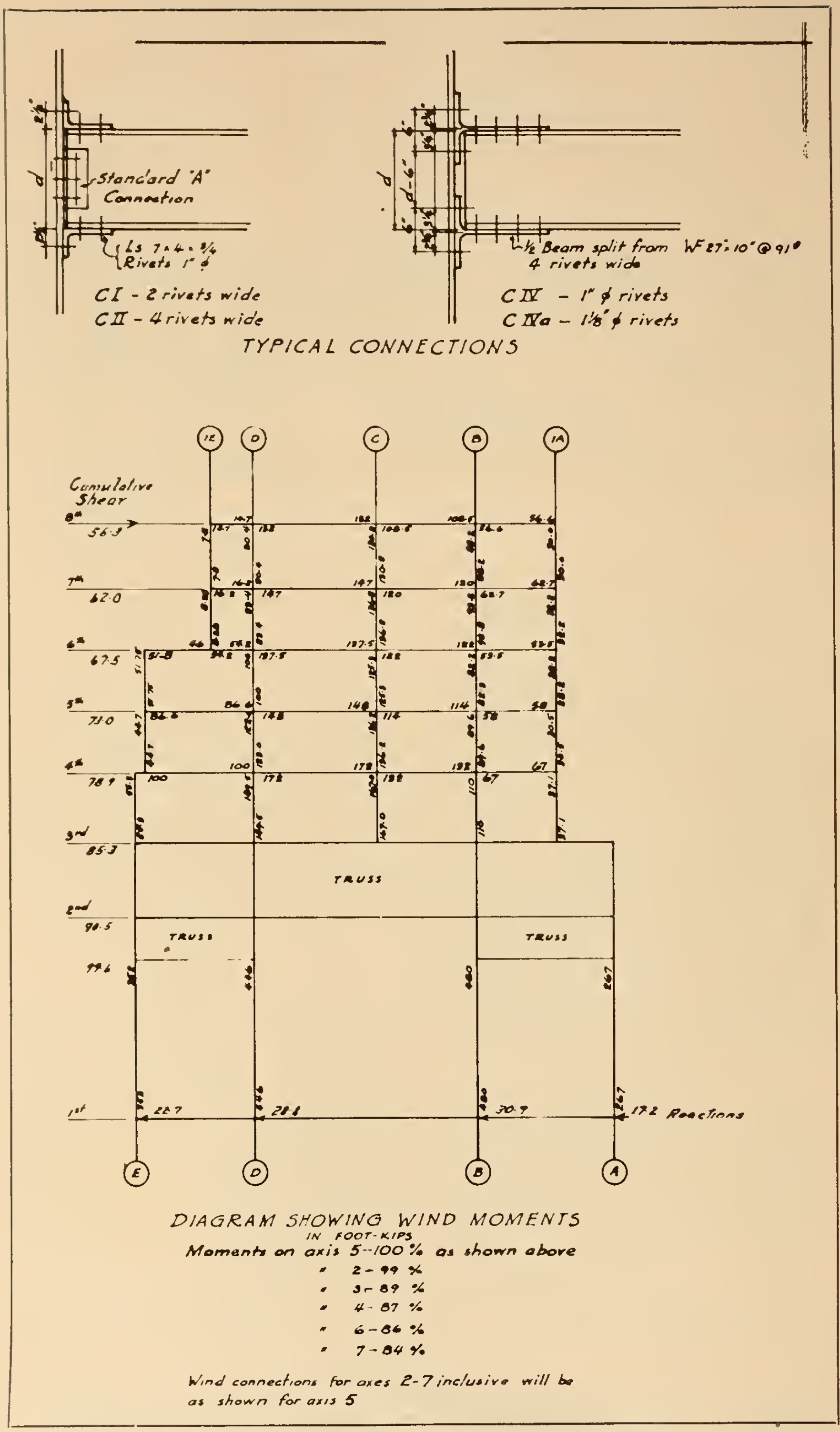


Fig. 7. Wind bents, moments and shears.

steel and copper of drill and torch resistive protection.

There are two separate entrances to the security vault, one to the securities portion for the bank's use only, the other to the safety deposit portion where there are at present some 3,000 safety deposit boxes for public rental. The two main doors are perhaps the show pieces of the vault equipment, and each of them has a weight of approximately 40 tons. They are duplicates in size, construction, and in security features. Each has actual solid metal thickness of 24 in., with liberal proportions of drill-resistive and torch-resistive metals.

With their crane hinges, periscopic sights for dual combination locks, quadruple movement time-locks and pressure clenching mechanism, they give the utmost in convenience for use and ease of operation. These doors and frames, prior to being embedded in the surrounding concrete, are plumbed to a nicety and exactness that is remarkable, for, once unlocked, the door can be moved from shut to open with a pull of not more than 15 lbs. Polished monel, rust-resisting, material has been used on all parts of the vault where mechanically possible, and where it is in view of the public; the result in the safety deposit portion is quite impressive — giving its effect of a solid steel structure, which in fact it is.

Particular attention has been given to the lighting of the vault interior, and for adequate ventilation of the vaults an independent air-conditioning system has been provided. The lower level of vault provides for fire and disaster proof storage of books and records and has not the steel lining and other special protective features of the security vault.

Two firms of architects joined to design and supervise the construction, consisting of Chapman, Oxley & Facey and Marani & Morris. K. R. Blatherwick, Bank of Montreal staff, was associate architect and Karel R. Rybka was consulting engineer for all mechanical trades. Isaac Ilsley was clerk-of-works, and the general contractors were Anglin-Norcross Ontario, Limited, with the vice-president and manager, Robert W. Johnstone, in active charge and Peter Sheret, superintendent.

The principal sub-contractors, apart from those for mechanical trades were:

Structural steel: Dominion Bridge Co.

Elevators: Otis-Fensom Co. with car cabs and hatch-way doors supplied and installed by W. S. Tyler Co.

Cut stone: Ritchie Cut Stone Co.—supplier.

Marble and terrazzo: Missisquoi Stone & Marble Co.—supplier.

DeSpirt Mosaic & Marble Co.—placing and finishing.

Lathing and plastering: W. J. Crowe.

Millwork and finished carpentry: R. Laidlaw Lumber Co.—supplier.

Painting: O. Brankston & Sons.

Ornamental bronze: General Bronze Corpn., Garden City, New York.

Vault doors, lining, deposit boxes, etc.: Separate contract by J. & J. Taylor, Ltd.

The New BANK of MONTREAL Building in TORONTO

A paper prepared for publication in The Engineering Journal

THE MECHANICAL and ELECTRICAL INSTALLATIONS

by

Karel R. Rybka, M.E.I.C.

Consulting Engineer, Toronto

In this paper, which is complementary to the accompanying paper by Mr. J. Morrow Oxley, the author discusses sewerage and drainage, cold water supply and its effect on air conditioning design, hot water supply, fire protection, boilers, heating, ventilation, air conditioning, electrical services, lighting and electrical distribution.

A general description of the building is given elsewhere in this issue. The monumental conception of the structure set a high standard for the quality of all services. It posed many problems in the selection and design of the miscellaneous mechanical and electrical installations for comfort and efficiency of the occupants, and the diverse installations which have become essential in large buildings, to ensure ease of operation and maintenance, and to give a high measure of safety.

The first complete plans of the project were prepared, and construction was started, before the last war. The entire structure below grade, and in part up to the third floor, was actually built at the time work was stopped, not to be resumed until six years later. The building was replanned after the war, but the space and general arrangement for the main portions of mechanical and electrical services could not be economically altered, as they were included in the early portion of the structure. This limitation did pose some serious problems, which were aggravated by the necessity of adding certain services not originally contemplated. (Fig. 1)

When planning the building, the architects realized the added cost which would result, in a building of this size, should the space occupied by mechanical and electrical services involve even a slight increase in minimum floor height. A floor to floor height of 11 ft. 6 in. was set for the typical floors and, except for corridors and washrooms, ceiling heights of about 9 ft. 3 in. or better were maintained throughout. This condition required careful planning of the extensive air ducts, heating, plumbing and electrical pipes, etc. The execution of the work required a more than usual measure of cooperation by the architects, engineers and contractors, as is clearly indicated by Fig. 2. The net result is a building which has provided a maximum of usable space and of services in a minimum of building volume.

Sewerage and Drainage

The street service for sanitary sewerage and storm drainage is common but, anticipating that it will be split in the future, separate systems of sanitary drainage and storm water drainage were provided inside of the building to the street line. The level of the sewer in the street is above the level of the first basement; therefore, the sanitary house sewer and the storm sewer collect only the soil, wastes and storm water from the spaces and areas above grade.

The soil and wastes from the large washrooms and other sanitary facilities in spaces below grade are collected in a sump at boiler room level, from which two automatic, motor driven centrifugal sewage pumps, each of 125 Imp. gals. per minute capacity, discharge them into the house sewer. The duplicate arrangement is meant for unusual peak loads and also as a standby, should one pump fail. A similar, separate sump and single pump assembly is provided for collection and discharge into

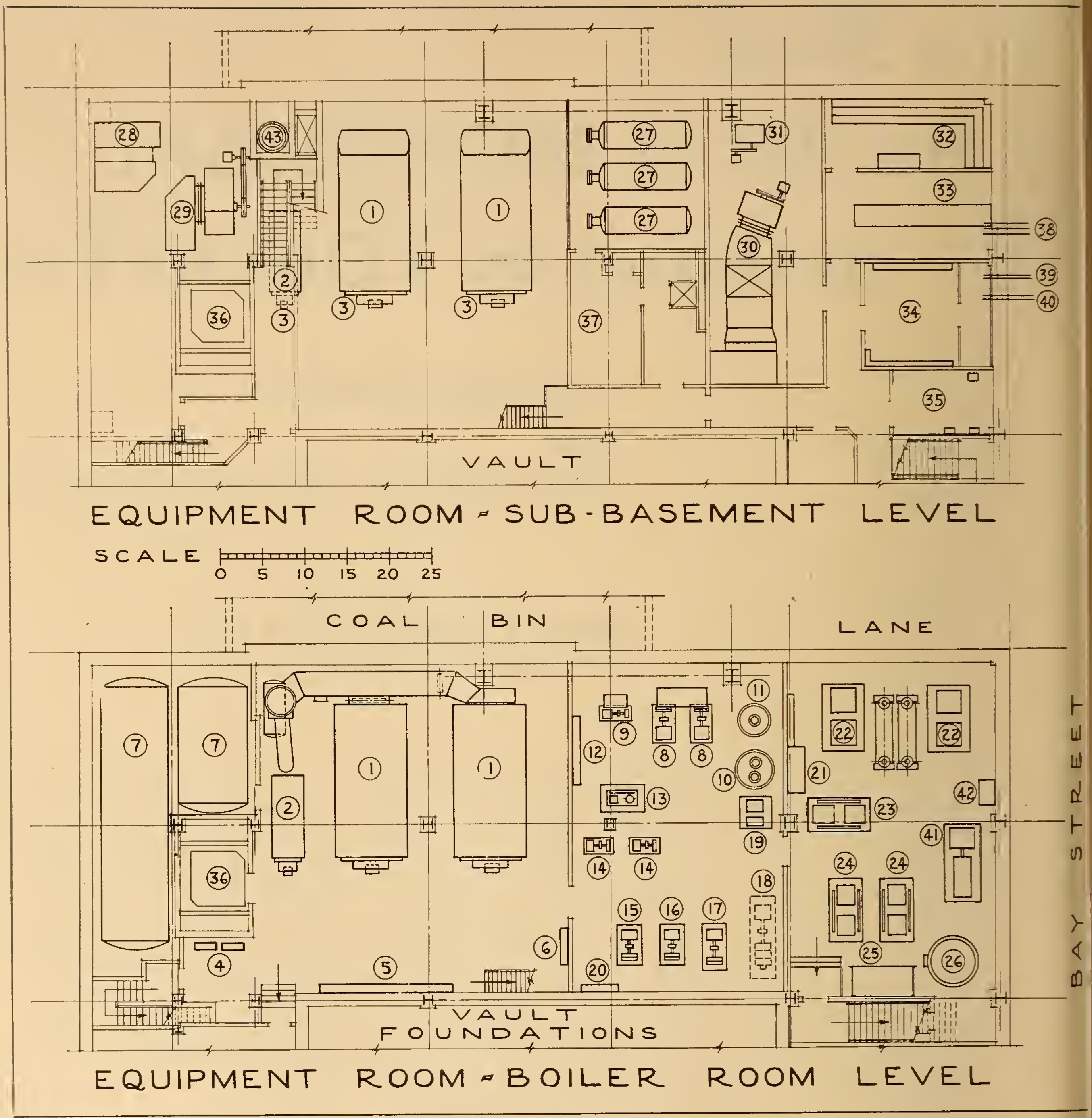


Fig. 1.

Legend

1. Main Boilers.
2. Summer Boiler.
3. Oil Burners.
4. Oil Pump and Heaters.
5. Control Panel.
6. Efficiency Instruments.
7. Fuel Oil Storage.
8. Boiler Feed pumps.
9. Summer Feed Pump.
10. Sanitary Sump Pump.
11. Sump Pump.
12. Pump Controls.
13. Air Compressor.
14. Drinking Water Pump.
15. House Pump.
16. House Pump.
17. Water Reclaiming Pump.
18. Future Fire Pump.
19. Pneumatic Tube Blower.
20. Control Panel.
21. Air Conditioning Controls.
22. Refrigeration Assemblies.
23. Motor Generator 60 cycle.
24. Motor and Diesel Generator 60 cycle.
25. 60 cycle Starting Equipment.
26. Suction Tank.
27. Domestic Water Heaters.
28. Vault Air Conditioner.
29. Banking Room Exhaust Fan.
30. Basement Air Cond. Assembly.
31. Basement Exhaust.
32. Emergency Light Battery.
33. Main Switchboard.
34. Telephone and Telegraph entrances and signal central.
35. Water and Gas Meters.
36. Elevator.
37. Engineer's Office.
38. Power Service.
39. Telephone Entrance.
40. Telegraph and Dom. Elec. Protection Entrance.
41. Diesel Engine Generator.
42. Starting Panel.
43. Smoke Stack.

storm sewer of clear wastes from boiler plant, equipment rooms, subsoil drains, etc. This sump can overflow into the sanitary sump in case of pump failure.

Cold Water Supply

The domestic water supply is taken into the building from the city water main in Bay Street through a meter in sub-basement. As the water pressure in this main is around 80 p.s.i., only the plumbing equipment, mechanical plant and air cooling coils in lower portion of the building up to the seventh floor are served directly by street pressure.

The plumbing equipment in the upper part of the building is supplied with water from a two-compartment 10,000 gallon storage tank in a penthouse on the roof, which also serves as reserve for fire protection of upper stories. Two pumps, one of 75 g.p.m., and one of 125 g.p.m., located in the pump room near the boiler plant, supply the storage tank.

In summer the water is first taken through the air cooling coils, before it reaches the storage tank. A pressure governor and a set of automatic shut-off valves are provided between upper and lower water supply systems, allowing use of excess water from the air cooling coils for plumbing in the lower part of the building and for the mechanical plant, and particularly for compressor cooling, in order to save water. A third pump is provided to deliver overflow water from air cooling coils in the lower building to tanks.

Two small pumps force water from city main to drinking fountains in the upper building, to avoid drinking of possibly stale water from storage tank. They discharge continuously a small quantity of water into the storage tank and keep the water column to the fountains fresh. A similar arrangement has also been provided for lower floors.

All pumps are electrically driven. Water to cooling coils and drinking water is refrigerated whenever the temperature of city water rises above 55°F.

Hot Water Supply

Three 600-gal. storage tanks, each with a steam operated coil, capable of heating 800 gals. of cold water per hour, are provided in the boiler plant. One of these is connected to the cold water main for the roof storage tank, and supplies hot water to the upper portion of the building. The other two supply the lower part of the building by city pressure. Tanks are so connected that any two can supply hot water to the entire building when the third is shut off for maintenance.

Fire Protection

A 6-in. diameter fire protection main is provided in the basement, with a standpipe which rises through all stories of the building. The top is connected through a double check valve to the water storage tank, the bottom similarly to the domestic water service on the street side of the water meter. Provisions for a future fire pump in the building have been left in domestic water mains and in the standpipe. A Siamese (steamer) outlet is connected to the fire protection main and is set above the sidewalk in the face of the building for hose connection to a municipal fire pump, or to a hydrant of the municipal underground fire main. This is a special water main that carries 300 p.s.i. water pressure whenever a fire alarm has been received from the downtown area.

One or more pairs of valved outlets are connected to the fire main or standpipe on each floor and are set in wall cabinets. One of each pair of outlets connects to a hose-reel with 75 ft. of 1½-in. diam. hose, which is at all times in readiness for emergency fire fighting. A fire extinguisher is also provided in each cabinet for emergency use. The other water outlet is threaded for fire department hose, and is for use of the municipal fire department, after the high pressure water has become available. In some of the infrequently inspected spaces, used for storage of inflammable materials and paper, also in carpenter's shop, and in tenants' storage rooms in the sub-basement, automatic sprinklers are provided for fire protection.

Boiler Plant

Two main boilers are provided for winter, and an auxiliary unit for the small heat requirements in summer. The two main boilers are of cross-drum straight water tube design, with steel cased fire brick settings, and are arranged for burning "heavy" fuel oil. Each has a heating surface of 1850 sq. ft. and is capable of producing 10,000 lbs. of steam per hour. They are designed for 125 p.s.i. steam pressure, but the actual operating pressure of the plant is only 30 p.s.i. A straight tube boiler was selected because, in an office building, ease of cleaning and tube replacing outweighs the slightly better efficiencies of the newer bent tube boilers. The summer boiler is of the three-pass water-walled fire box type, with 500 sq. ft. of heating surface, operated at the same pressure as the main boilers. All three boilers are valved so that any one boiler or any combination can be used simultaneously to give maximum flexibility.

A low operating pressure is used because the boilers are intended for heating and some kitchen services requiring under 30 p.s.i. steam pressure. No long distributing mains, which would justify steam distribution at high pressure, are necessary in this compact building. The additional cost for installing auxiliary equipment such as pumps, feed water controllers, etc. suitable for a higher operating pressure, and the increased maintenance cost of a high pressure plant would have been quite considerable.

Compressed air operated soot blowers are provided in each boiler for maintenance of clean heating surfaces. The electrically driven air compressor of this system also supplies compressed air for cleaning of motors, elevator machinery and the like throughout the building.

A condensation tank collects the condensate from heating and other services and two electrically driven feed pumps force it back into the boilers. A similar smaller assembly with a single pump is provided for the low summer load. Simple float operated feed water regulators which supply city water as makeup are provided in all boilers.

All three boilers are equipped with oil burners of horizontal, low pressure, rotary atomizing type, having fully automatic modulating fire. They are designed with oil heaters and temperature controls to permit using any available commercial grade of fuel oil. Fuel oil storage of about 13,000 gals. is provided in the building. A bunker for any future compulsory conversion to coal is provided under the lane adjacent to the boiler room.

Supervisory instruments showing and recording steam flow, gas

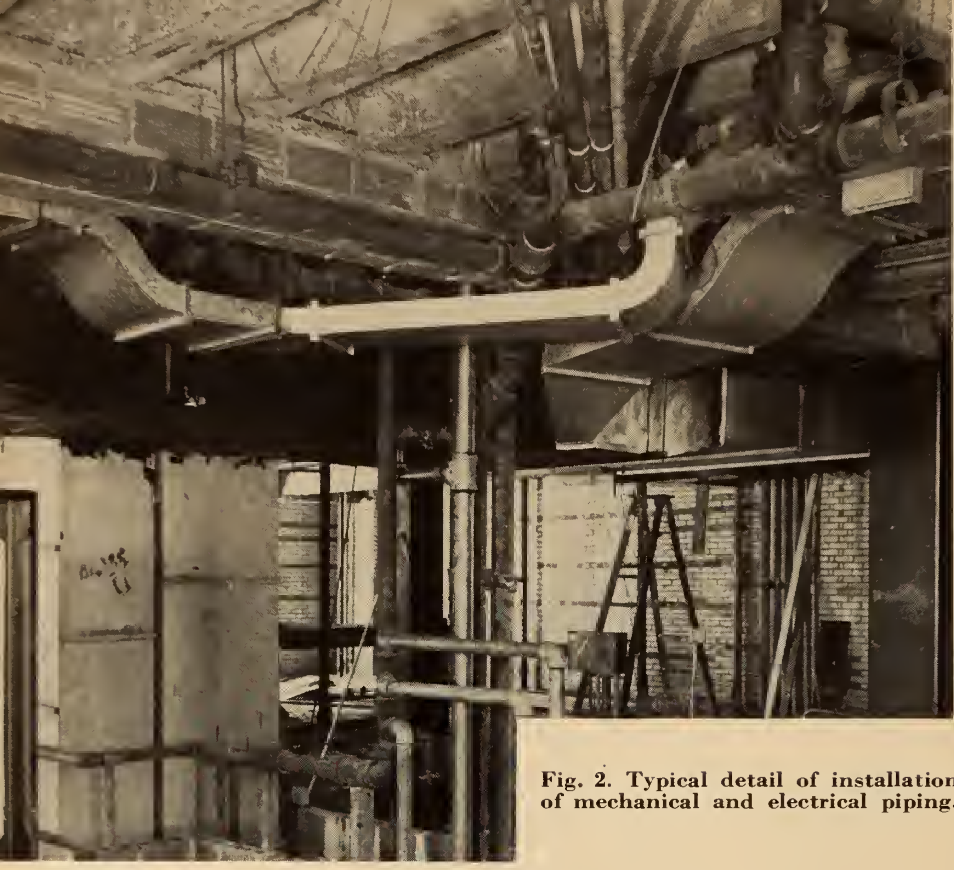


Fig. 2. Typical detail of installation of mechanical and electrical piping.

flow, flue gas temperature of each boiler, steam pressure, feed water temperature, and outside temperatures, are provided in order to assist the operating staff.

Heating

Two systems of direct heating are provided. One is for areas occupied by the Bank itself, and is equipped with individual automatic temperature control in the different spaces.

The control is arranged to also co-ordinate the air conditioning in the offices with the direct heating.

The other system serves the tenant-occupied part of the building above the fifth floor, and is centrally controlled and zoned.

The heating of each face of the building is varied in accordance with the weather by a temperature controller placed outdoors. The only corrections made by hand are those for sun effect. These manual adjustments are made in the engineer's office on a panel which guides the operator by temperature indications taken in 16 key rooms in the building, and transmitted to the panel electrically. The lower heating system operates with steam at 5 p.s.i. gauge pressure. The upper zoned system uses steam from 0 to 5 p.s.i. gauge pressure. Entrances, and basement areas are heated with forced hot air.

Cast iron convection type radiators, concealed behind ornamental grilled panels and placed in window recesses, are used throughout. This placement counteracts the cold down-drafts from windows, and provides proper heating when air conditioning plants are inoperative. Special deflectors and radiators are provided under large windows in the main banking room, to counteract the extremely heavy down-drafts which otherwise would ensue.

Air Conditioning and Ventilation

The building is equipped with all year air conditioning, including filtering of air, heating and humidifying in winter, and cooling in summer. Limitations imposed by the owners forced the provision of separate, central air conditioning plants for individual floors. Each plant supplies about 10,000 cu. ft. of treated air per minute, though only part of it is outdoor air. A separate air conditioning plant is provided for the large vaults in the basement and sub-basement. A supply ventilating system is provided for kitchen and associated spaces.

The sub-division of air conditioning by floors simplified some of the features of design, as it

Fig. 3. (below, left) Three-compartment underfloor duct system for electrical services—prior to finishing floor.

Fig. 4 (Below, right) Close-up of three compartment underfloor ducts.

reduced space requirements for air ducts and air intakes. It also avoided some complications with fire regulations, encountered with multi-storey air conditioning plants. On the other hand, the sub-division posed a serious problem in zoning the building for proper temperature control. It became difficult to sub-divide each floor in sections that would compensate heating and cooling in accordance with outdoor changes in weather, as well as in accordance with sun effect in rooms with outside walls and windows; and at the same time that would cool at a reasonably constant rate the interior rooms, to offset heat given off by occupants and lights. This is most noticeable in the winter owing to large temperature difference between outdoors and indoors.

The zoning of the heating system to suit the faces of the building allowed a reasonably simple solution. The heating system is designed and operated to just supply the amount of heat lost through walls and windows to outside. The air conditioning system then supplies air which is automatically maintained at such temperature, to offset the heat gain inside. Venetian blinds and double glazing compensate for the bulk of the sun effect.

In addition to the all year air conditioning of working spaces, considerable quantities of contaminated air are being exhausted from washrooms, kitchens, boiler room and pump rooms, and storerooms in basements. A large amount of air is being exhausted from the ceiling space over the main banking room, which houses about 100 kw. of lighting equipment. Care has been taken in the designs that the amount of air so exhausted from the building is slightly less than the quantity of outside air brought into the building by the air conditioning systems. The four exhaust fans are located in two fan rooms on the roof. All air conditioning and ventilating equipment, which is spread through the entire building, can be started and stopped at a central switchboard in the refrigeration plant in the sub-basement. Automatic controls are compressed air operated.

Fig. 5. Air conditioning ductwork in ceiling.

Water For Air Conditioning

When the building was first planned in 1938, little if any need existed in Toronto for refrigeration for air conditioning. City water temperatures in summer have for many years been consistently below 55 deg. F., except for very rare occasions, usually late in August, when temperatures reached 65 deg. F. Thus, most of the large air conditioning installations relied solely on the apparently unlimited supply of cheap city water suitable for air cooling. Regardless of this condition, the mechanical equipment spaces and services for this building were planned to allow the installation of a refrigeration plant for air conditioning, should conditions of water supply change.

The constantly rising demand on the municipal water supply system could, in the author's opinion, lead only to rising water temperatures and restrictions of permissible water consumption. These forecasts have since been vindicated. Due to increased water consumption and to consequent construction of additional pumping capacity, and perhaps also due to the generally diminished water supply all through the country, the spells of water temperatures

Fig. 6. Main Switchboard.
Note metering compartments at right end behind doors.

above 55 deg. F. have become more frequent and prolonged, and refrigeration for air conditioning became advisable.

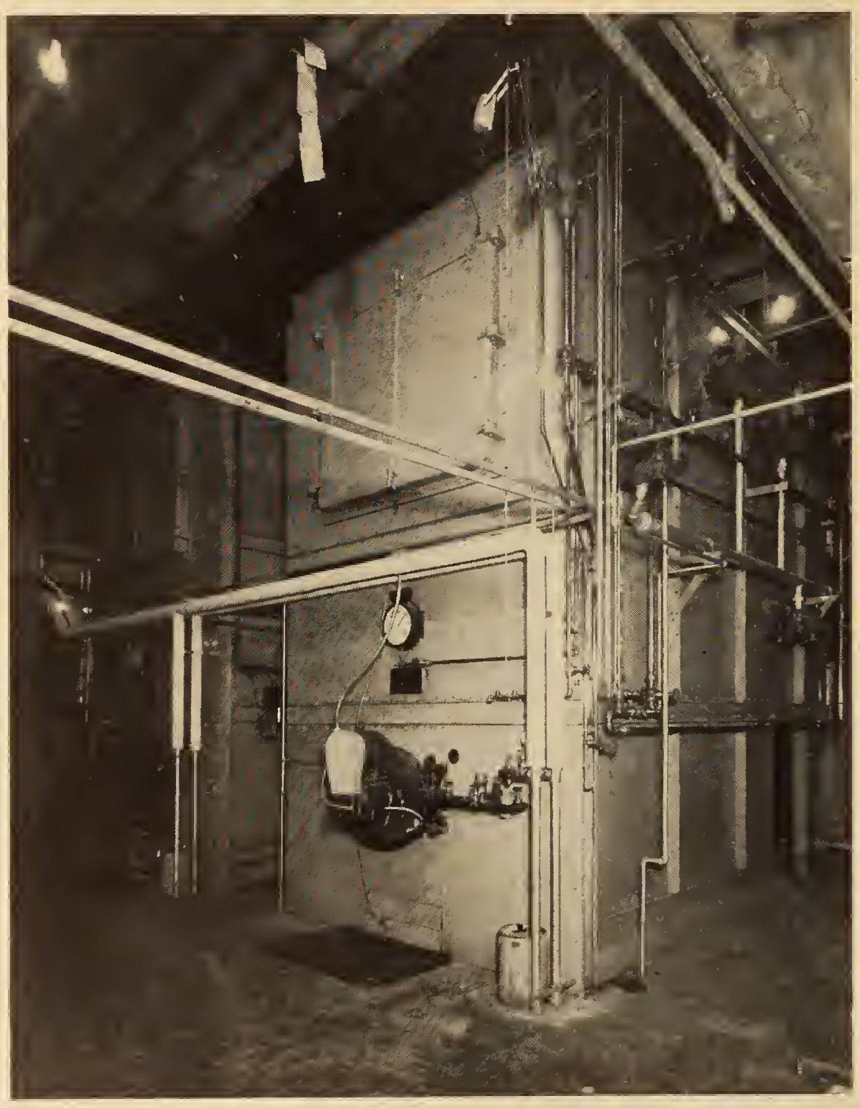
The space set aside for refrigeration equipment had been reduced to about half its extent to make room for emergency power equipment. It thus became necessary to find a way to reduce the refrigeration plant against earlier estimates. The finally selected refrigeration plant is designed to merely reduce the temperature of the city water by 10 deg. F. The water cooling plant comprises two 50 h.p., motor driven compressors, with a combined capacity of 1,800,000 B.t.u. per hour.

Electrical Services

The building management pays only for power used in the premises occupied by the Bank and for operation of general services. The tenants each pay for the current consumed on their premises. The building is located in the so called "network" area of Toronto. There the Toronto Hydro supplies 25 cycle alternating current, at 208/120 volt, 3 phase, 4 wire, from transformer substations under sidewalks. This is done mainly for simplification of the distributing network and of the services into buildings, but does not affect the rates charged to the consumer. The highest charges are for commercial lighting, with lower rates for cooking and for operation of motors, power equipment, etc.

In view of this, the main switchboard is subdivided into four sections—one for motor power, one for cooking power for kitchens and social rooms, one for lighting of the Bank and of all public spaces and one for tenants' floors. The first three sections include utilities meters immediately after their respective main circuit breakers. The last section is not metered, and the cables from this section lead to the distributing panels on tenanted floors. There, separate service switches, meters and distributing centers are provided for each tenant, in addition to any panels required for public spaces.

Fig. 7. Boiler plant, during construction, incomplete.



Integral with the main switchboard is a separate switchboard for alternating current of 60 cycle 208/120 volt, 3 phase, 4-wire, which distributes approx. 100 kw. of current produced on the premises by three motor generators, and is used for fluorescent lighting in some of the areas occupied by the owners, and in the corridors throughout the building. This characteristic has been selected, in order to permit simple connection of this separate system to main service, if and when 60 cycle utilities power is made available to the building.

The connected electrical load in this building exceeds 1,500 kw., and led to placing a substation under the sidewalk immediately adjacent to point of entrance of power service into the building. A set of heavy, bare copper bus-bars has been installed in a masonry compartment between the secondary buses in the substation and the terminals of main switchboard in sub-basement. In order to ensure best service even during interruptions in power supply, a 65 kva., 25 cycle, 208/120 volt Diesel engine driven generator has been added to the equipment. This unit develops sufficient power for operation of one elevator, and of the more important mechanical equipment, such as oil burners, most pumps, etc. Two of the 60-cycle motor-generators are also equipped with auxiliary Diesel engine drives, which allow for emergency lighting of most of the spaces that are occupied by the bank and of corridors throughout the building.

All three Diesel engines are arranged for manual push-button starting, and manual transfer of the selected circuits to emergency power which, in case of an unforeseen power failure will involve a short time delay before emergency power becomes available. A system of battery operated lights is therefore provided in all important spaces occupied by the bank and in basement and sub-basement corridors, in elevators, some internal stairs, etc. These lights come on automatically on power failure and ensure reasonable safety until the Diesel engines are started.

Lighting

Lighting in the tenanted portion of building is semi-direct. The average light intensity on the work plane is about 35 foot candles, from 300-watt fixtures. Wiring has been planned to permit an increase to about 50 foot candles through replacement of lamp socket and lamp with a 500 watt size. This selection was made for economy; the more recent fluorescent lighting fixtures would have cost considerably more and the power saving, with only at most 2,000 hours per annum of usage, would have compensated only for a small part of the additional cost.

In the spaces occupied by the bank, considerable fluorescent lighting has been introduced because much of the lighting equipment was specially designed to suit architectural treatment and finishes. The stroboscopic effect of 25 cycle lighting, which becomes very noticeable with low intensity lamps, forced the choice of 60 cycle current for this work. Some prominent features of the exterior of the building are to be floodlighted at night when power is available. Municipal regulations and restrictions forced acceptance of the municipal light and signal standards on the sidewalks along the building, which are incongruous with the architectural design, and some of the originally planned features of street lighting around the building had to be abandoned.

Electrical Distribution and Special Services

An extensive network for distribution on the different floors was required by the complexity of the miscellaneous services and the need for utmost flexibility to permit easy changes in floor plans whenever desired. The problem was aggravated by separate metering of current for each tenant. The ceiling lighting in each bay of the building is served from an outlet box, from which a conduit and the required wires are carried back directly to the electrical room. These wires can be easily transferred from one tenant's panel to another, to take care of changes in tenancy. The auxiliary electrical services, as required for desk lights, business machines and the like, are brought to any point of the floor through one channel of the three compartment underfloor duct system. Their " feeder " conduits and wires too are terminated in the electrical room for easy transposal. It is also possible to supply any tenant who may require power for special business equipment, with 60 cycle power, which is then carried in the same duct channel with 25 cycle wiring.

One channel of the underfloor duct system is allotted to the Bell Telephone Company, whose system in the building contains an automatic private exchange on the fourth floor. Trunk lines are brought to this point and the distributing cables are taken from there to panels on alternate floors and extended therefrom to the telephone section in the underfloor duct system. This network permits installation of telephone outlets anywhere in the building without exposing any of the wiring except for a short connection from the floor fitting to the instrument. It also allows installation of private switchboards on diverse floors wherever required. For telephone service in the bank premises a large manual switchboard has been provided.

A third channel of underfloor ducts carries communication and signals wiring such as — C.N. and C.P. telegraph messenger call wires, Dominion Protection, house telephone connections, fire alarms, wiring for centrally operated clocks and date stamps, and miscellaneous bell wiring, etc. Any special electrical wiring which may later be required can also be installed in this channel. The C.P. & C.N. Telegraph messenger call system consists of a service cable underground from nearest telegraph office. The cable is carried through a distributing panel-board and wires are extended into the signal section of the underfloor duct system, permitting call stations to be placed anywhere within the building to ring in the telegraph office.

The Dominion Electric Protection system consists of two subdivisions. One serves the needs of the bank, and consists, during the day, of a manually operable hold-up alarm from diverse key points and, at night, of an automatic system of protection with timing devices, door controls, and microphones for vaults. The other service is a watchman's " check-in " feature which automatically advises the Dominion Electric Protection Company's central when the two night watchmen in the building have fulfilled the exact requirements of the hourly round of inspection.

The fire alarm consists of one or two " break glass " type alarm stations on each floor, connected to the municipal fire department and also to an annunciator in the entrance lobby and duplicate annunciators in the superintendent's and chief engineer's offices. Sprinkler systems in storage spaces and workshops are also connected into the alarm circuits.

The centrally operated system of clocks and date stamps is intended mainly for the offices used by the Bank, in order to coordinate operations.

BUILDING COSTS and PRODUCTIVITY OF LABOUR

A résumé prepared for The Engineering Journal

by

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The increase in building costs during post-war years is one of the most disquieting features of our economy, not only in Canada but throughout the western world. It has been so much greater than the co-incident increase in the general cost of living that there is a serious state of unbalance. A brief review of some of the elements involved may be of value.

The Building Costs

It is customary to divide building costs into three main parts — materials, labour, management. The cost of materials is taken as the delivered cost ready for fitting and use. Tracing back to the origin of the material it is apparent that in its production from forest, mine or pit through purchase of prime source, transportation, manufacturing plant, processing and packaging a similar three part division can be made. A break down of delivered material costs for several principal items indicates that on the whole labour, at one stage or another, is the predominating element and it has been estimated that it comprises over eighty per cent of final cost.

At the building, site activities consist of preparation, including demolition and excavation, receiving and stowing of materials, erection, fitting and finishing, and the total of labour is proportionately more than that for delivered materials. The part of labour in management consists mostly of clerical assistance which will not be included in the present discussion.

Under existing conditions most of the labour employed on building materials and construction is under union control, influencing rates of pay, hours and conditions of employment, jurisdictional questions, and directly or indirectly, rate of production. The influence of rate of production is one of the most important influences affecting building costs.

Generally, building cost indexes are based on fixed quantities of the principal materials at published prices and hours of labour used on construction. They do not attempt adjustment for variations in productivity of labour, availability of material when wanted, efficiency of management, competitive conditions in pricing and several other items affecting actual final costs such as overtime or bonus payments to workers and premiums for quick delivery of materials.

Cost indexes, adjusted approximately for these unknowns, show figures of 220 to 230 for the end of 1948 on the basis of 1939 equal to 100.

Labour Efficiency

In considering the significance of cost index figures, the most disturbing element is that of productivity or efficiency of labour. It is disturbing because it indicates an unwillingness on the part of many workers to "pull their weight". Reports compiled from sixteen cities on this continent comparing conditions with 1939 show that average productivity of skilled labour rose from 65 per cent in 1946 to 73 per cent at the end of 1948 and of common labour from 67 per cent to 82 per cent in the same years, but the gains are not distributed through all the trades and in some cases are not continuing or have not even appeared effectively.

Bricklaying is a skilled trade that may be taken as an example of variation in productivity although other skilled trades have shown similar tendencies. Reasons for choosing bricklaying as a criterion are that the standard size of brick and method of setting have shown remarkably little change in several centuries.

A review extending back for nearly three hundred years is not reassuring. Production results used for estimating new work and based on average accomplishment per hour of one bricklayer with his labourer helper have been about as follows:—

Date	*Average number of bricks laid per hour*
1667	100
1703	100 to 150
1734	100 to 150
1749	100 to 150
1835	100 to 120
1927	85 to 100
1929	75 to 100
1934-5	100 to 150
1939	50 to 85
1948	35 to 75

It should be noted that until after 1900 the average working day was ten hours, often longer, and that the bricklayer's work included the erection of his own scaffoldings. In recent years the working day has been eight hours, sometimes only seven, and co-incident with the increase in height of buildings, scaffolding has been erected by specialists and other mechanical aids have been introduced. It is also noteworthy that in the same localities bricklayers paid on a basis of per thousand brick laid instead of on a straight time basis are setting at a rate of 125 to 150 bricks per hour.

This presents a rather sorry picture. It indicates that those primarily responsible are not honestly playing the game and are short-sighted. First, because they are not only permitting, but apparently encouraging, those under their guidance to waste time and energy. So called "make work" practices are rife, in the belief that, by extending the number of hours required for a given job, the total number of hours of employment of the trade on all jobs is extended in like degree. Second, the short-sightedness of these practices is evident. Many jobs that ten or twenty years ago would have been, as a matter of course, designed with brick or tile are now being done with new methods and materials that do not employ the trowel trades. Light steel framing with enclosing walls of metal or other sheet material and insulation more efficient than masonry; "dry wall" construction for partitions instead of tile or gypsum block are but two examples of many methods available. The bricklayers are going a long way to "kill the goose—."

Some of the other trades show similar tendencies and it is not a healthy condition for the country.

An interesting, indeed remarkable, exception to the general trend to low productivity was shown by a group of the older men on a recent job. Stone-masons, varying in number from eight to twelve and in age from fifty-two to seventy-three, had a very low percentage of absenteeism and a good record of steady production. This in spite of the fact that the work proceeded through the depth of winter and that, at times, it was necessary to climb eight or nine storeys of stairs to get at the day's work. This and other recent experiences indicate that the all-too-prevalent impression, that a man is past his most useful days at the age of forty-five, has little foundation in fact.

Where is the old spirit of craftsmanship, of honest satisfaction in a good job well done? Has it been largely replaced by craftiness, an effort to see how little will get by?

The prevalence of cost-plus-fee contracts coincident with lower productivity has interacted in such a way that it is difficult to separate cause from effect. The necessity for this form of contract has been imposed by the impossibility of fixing firm cost prices for work to be done which might extend over many months or even several years. The principal weakness of this form is that, no matter how competent the contractor and his staff, everyone connected with the job knows that it is a cost-plus job and that whatever the costs may be they have eventually to be paid by the owner. The spirit on the job tends to be different from that shown on a firm price contract, where each worker knows that any overrun in cost comes out of the contractor's pocket, and his sense of loyalty to his boss and apprehension as to the continuity of his own employment provide inducements to an honest day's work.

Britain's Huge Programme of Developing African Resources

British Uganda and Egypt have launched one of the world's largest irrigation and power schemes. Conceived some 40 years ago, it compares in size with the Tennessee Valley Authority and the famous Dnieper Dam, the U.S.-aided project in Russia.

The project will make possible an increase in the cultivable area of Egypt from 5.9 million acres to about 7 million. In the Sudan, jointly administered by Britain and Egypt, the irrigable area will be increased from 862,000 acres to 2.5 million acres. Thousands of swampy acres in the southern Sudan will be reclaimed and electricity will be provided for the industrialization of Uganda. The electric power will be used in cotton ginning, fertilizer production, seed crushing, copper smelting, and also in the rubber, tobacco, tea, coffee, and flour factories and the saw mills. Energy will also be supplied to parts of Tanganyika, and possibly to the Belgian Congo.

The first stage is the construction of an enormous dam at the Owen Falls, to regulate the level and discharge of Lake Victoria into the White Nile, at a cost of some $48 millions. Six 15,000 kilowatt turbines will be installed. Later the dam can be heightened and two extra 15,000 kilowatt turbines added.

The later stages of the project will be a string of regulating works along the White Nile, including another big dam at the Albert Falls, and a canal system 300 miles long to by-pass the Sudd, the big swamp area of the southern Sudan where the Nile loses much of its precious water. If the Abyssinian Government agrees there will be a third dam on Lake Tana.

Another important project is the harnessing of the Zambesi River, the boundary between the two Rhodesias. This scheme involves the construction of a huge dam and power house at Kariba Gorge, several hundred miles downstream from Victoria Falls, and a 250-mile railway linking the Kariba Gorge with the main line. The energy developed will be used for industrializing the heart of Africa, and some of the world's largest deposits of coal and chrome ore will be developed.

Other projects are the scheme to use once barren land in Tanganyika, Northern Rhodesia and Kenya to grow groundnuts, a big increase in the output of the great Wankie coal mine in Southern Rhodesia, and the great expansion of technical training for Africans. New roads and railways are already being built in Tanganyika, and across the continent a deep-water quay is being constructed at Freetown. All these enterprises call for more capital goods, just at the time when they are most urgently needed in the United Kingdom. Nevertheless shortages are gradually being overcome.

SHARE YOUR STORY*

The text of a C.B.C. Coast-to-Coast Broadcast, delivered on Sunday, May 15, 1949 by

John Fisher
Staff,
Canadian Broadcasting Corporation

He is tall and thin and his face has the patient look of a scholar. Not many of the English speaking people in the great banquet hall of the Chateau Frontenac had ever heard L'Abbe Maheux. Father Maheux was seated at the long head table . . . in front of him sat the engineering cream of Canada. This learned priest who has written so much in French and English about the relations of the two language groups had been invited to speak about the history of Quebec City. He did it in a unique and charming manner. He said that Quebec City was a great tourist center — but Quebec had always known tourists. In fact it was the first to welcome tourists in North America. Then he traced the long story of the first tourists . . . he spoke of Admiral Phipps . . . he came with guns, so did many others of the would-be conquerors. Finally the Abbe referred to General Wolfe who came to stay. He then discussed the present-day charm of old Quebec. As he looked out over this great gathering of engineers he indicated just what important tourists they were. The Abbe was right. I could not imagine a gathering more important to Canada than a society of engineers. No country in the world owes so much to the men who pushed across the steel, who conquered and tamed our rivers and penetrated deep into our northern hide.

No country stands to gain so much from the engineer as does this unlocked treasure house of the north. If the engineers of Canada decided to cease work tomorrow this whole country would be paralyzed. The great turbines would stop . . . the water of sewer and energy would lack the guiding hand. Transportation would be reduced to foot locomotion. Just look around your own room in your own house. Nearly everything you touch had to be designed on a draughting board. The plates you use, the thread on the top of a bottle, the fixtures, gadgets, conveniences all come out of the engineering brain. In Quebec at the 63rd Annual General Meeting of The Engineering Institute of Canada, I was privileged to see a cross-section. Here were gathered the big names. Here came men from companies which are as Canadian as the maple leaf.

A Saga of Achievement

For three and a half days they met to hear the new feats of their profession . . . at these panel discussions they heard about a new super highway which cuts the wild Laurentian mountains and brings remote Lake St. John country within three hours of the ancient capital. At this conference the engineers gazed at a scale model of an aluminium bridge. This was presented by the Aluminum Co. of Canada and is a model of the aluminium arch bridge under construction at Arvida. What will this mean to bridge construction? Will it mean better and more beautiful bridges, will it completely change the engineer's concept of bridge construction? Canada, the land of rivers and streams, is vitally concerned with anything new in bridges. Here the delegates also had a peek at streamlined logging operations in the pulp and paper industry; they heard how the old order had changed with the advance of the machine. Now, thanks to technology, wives and children follow their husbands right into the bush. We also learned about the new high-speed newsprint machines which help Canada to hold her place as the producer of three out of five pages of newsprint read in the world.

And speaking of first things, I heard one aeronautical engineer tell of the great race between Great Britain and Canada for the honour

EDITOR'S NOTE:

In the "Professional Guide for Junior Engineers" the late Dr. W. E. Wickenden wrote: "By instinct and tradition, engineers are good collaborators. A true engineer is much more intent on getting things done than on getting exclusive credit for them and he willingly lends a hand with other workers. His natural impulse is to share his experience with other engineers".

But the engineer has been reticent in sharing the story of his accomplishments with those outside the profession. This was the opinion of John Fisher, "the C.B.C.'s Wandering Reporter and Observer of the Canadian Scene" when he attended the Institute's Annual Meeting in Quebec. He admitted he was impressed by the record of achievement disclosed by the discussions but astonished that so little of the record had been made known to those outside the profession.

In his broadcast of Sunday, May 15th, published here through the courtesy of the Canadian Broadcasting Corporation, he presented to his great radio audience his impressions of the meeting.

*Published by courtesy of the Canadian Broadcasting Corporation and John Fisher.

of producing the first jet airliner. From what I learned, Canada may be the first nation to fly civilian passengers by jet propulsion. This plane, built in Toronto, may be ready some time this Fall.

The engineers were also told by a Defense Research Board expert just what would be required of them if Canada had to develop or manufacture guided missiles in an emergency. The range of the subject was unlimited here. For instance, a Canadian army research development man explained the tricks of high-speed photography. And speaking of photography, that brought up the subject of television. There were several lectures on television and the engineers were treated to a special talk by one of the greatest authorities in the United States. On Thursday night the Ballroom was jammed with delegates and wives and Quebeckers who came to see a television show. The chairman of this meeting was Al Ouimet, assistant chief engineer of the CBC. The R.C.A. research laboratories from Princeton, N.J. set up around the banquet hall fifteen different receivers. Outside the entrance were the big television cameras and lights. For nearly two hours there was a constant parade before the cameras. The president and president-elect, distinguished engineers, and government leaders were televised and the results followed in the next room. This was certainly one of the most popular items on the agenda.

Women Engineers

On Friday, the male delegates found some competition from a most unexpected source. Engineering in the past, faced with the problems of nature's stranglehold, has called for a mixture of brawn and brain. It was a man's profession . . . or so it seemed that way. But, as in most professions, the line has been weakening and the citadels of man's immunity have been falling. It took a hefty tumble on Friday, May 13th, in Quebec City when a grandmother and president of a big firm of consulting engineers took the speaker's stand. Dr. Lillian M. Gilbreth of Montclair, N.J., was given the honour of discussing one of the most complicated phases of engineering . . . namely, human engineering in management. And, she was introduced by another engineer who was also a woman — Elsie G. MacGill, consulting aeronautical engineer from Toronto. Let's digress for a moment and look at these two women engineers. Perhaps you have read, "Cheaper by the Dozen". Dr. Lillian Gilbreth is the "mother" in that story. When I say "mother", I mean it . . . for she is "mom" to 12 children and bringing up 12 children is an engineering feat in itself. No wonder she's a consulting engineer. Evidently she made a science of it, for in 1912 she wrote "Psychology of Management" and followed it with books on "The Homemaker and her Job" and "The Foreman and Manpower Management", to mention only a few. But, she came to Quebec as a leader in the field of human engineering. Now let's look at her Canadian counterpart . . . the woman engineer who introduced her. Elsie MacGill of Toronto is one of the leading aeronautical engineers on this continent. She, too, astounds in her ability to stand up with the rest of them. Her mother was a lawyer and a judge in the children's court of Vancouver. She has a tremendous personality and I will use her for the theme of my talk — we don't know about her in Canada. Her American counterpart has been portrayed and her achievements made known to the public. I quarrel with the dearth of background material on Elsie MacGill as I quarrel with the whole Engineering Institute of Canada. I followed their sessions at Quebec with profound interest. I listened as they unravelled the threads of achievement — in informal discussions, I heard them debate the triumphs of building the Quebec bridge — of pushing steel through the Rockies and across the unsmiling face of Lake Superior. I listened when they slipped into the technical jargon of Shipshaw . . . the structural stresses and strains of a new aluminium bridge. I heard them haggle about highways; enthuse over the bigness of Welland . . . they talked about the engineer in business . . . they slipped into each phase . . . industrial, mechanical, chemical, civil, aeronautical, forestry, etc. I heard them worry about the divisions between architects and engineers. They even brought university students to this conference . . . one from each of the 11 degree-granting universities . . . all expenses were paid. And these neophites were allowed to sit in and question deans of the profession.

These students certainly will be impressed with the contribution of the west. Three of the top awards of the Engineering Institute went to Consolidated Mining and Smelting men from Trail and Kimberley, B.C. — R. W. Diamond, A. H. W. Busby, and P. T. Bloomer. In the world of engineering, this might be called the year B.C. — Dr. Finlayson from Vancouver is the retiring president of the Engineering Institute; R. W. Diamond of Trail is immediate past president of the Canadian Institute of Mining and Metallurgy; Eric Druce of British Columbia is president of the Canadian Society of Forest Engineers and Frank Forward, of the same province is president of the Dominion Council of Professional Engineers. It is a record for one province.

These young men know what the engineer has meant to Canada and can mean tomorrow. They know that wars are won by engineers and scientists. From talking to these young students I crystallized my own thoughts. I found them hungry for more too. Sure, they appreciated the genius that went into the Quebec Bridge — they know what problems the Rockies presented. But I found them hungry for excitement. Like Canada, they are young and waiting and they expected the engineering profession to open up and lead and show Canada what we can do with the conquest of snow and ice and trees and break-up and freeze-up . . . what are we doing about the winds that blow the top-soil away? What are we doing to reverse the flow of rivers in the Rockies?

The Engineer's Contribution

What are we doing about the waste of water across the Prairies and in the St. Lawrence? What are we doing about the waste of the woods? What is the engineer doing to bridge the gap between his profession and pure science? Who will fill this void? Are not the problems of democracy so tight and complex that the engineer must emerge from his draughting board and plan for society? Sure, the very nature of his profession demands the traditional sureness and caution of science. He can still retain his caution, but, from his knowledge he can give us light . . . he can excite us and build up public pressure for the very things he knows should be and can be done. By talking about them now — by sharing the story — the engineer will stand a greater chance to see the fruits of

(*Continued on page 489*)

PRECIPITATION-EVAPORATION RELATIONSHIP *for* THE CANADIAN PRAIRIE

by

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A paper delivered before the Saskatoon Section of the Saskatchewan Branch of The Engineering Institute of Canada on October 29, 1948

Those interested in the climatic problems of the Canadian Prairie are familiar with the terms "Dry Belt" and "Drought Area", but it is doubtful if the terms suggest any definite area to us, and the area so designated may change from year to year. We also hear the term "Palliser Triangle", which has definite geographical boundaries, but represents an appraisal made some ninety years ago when limited data was available. Other early explorers and engineers, such as Hind and Fleming, made more detailed maps of the prairie, outlining dry or undesirable areas; but there has been no recent attempt to outline a "Dry Belt" or "Drought Area" on the basis of records now available. There may be good reasons for not attempting such a task.

This paper represents an effort to outline the area of moisture deficiency and, to some extent, show the severity of the deficiencies. We have considerable Government data on precipitation, temperatures, etc., some of it in map form, but no one set of records by itself gives all the information wanted. The aim of this paper is to assemble the information available in a form that gives the clearest picture of average conditions prevailing. Government records are based on the average, or mean, for the period of record, and the results should reflect that average. This study is not made primarily for an assessment of the agricultural possibilities of the prairie area, and as explained later, the resulting charts might be misleading, unless the full discussion is carefully considered.

The author suggests a new approach to the delimitation of the "drought area" of the prairie provinces. He would base it not merely on rainfall, but on temperature, wind intensity and the resulting evaporation as well, as determined from meteorological records combined with precipitation and stream flow records. Contending that the so-called "Palliser Triangle" would have quite a different outline if determined in this way, he shows that climatic conditions have a more important bearing than rainfall on surface and ground water supplies.

Evaporation An Important Factor

Precipitation records alone do not fully describe the moisture conditions of an area, for we find near arid conditions in lower latitudes with precipitation of twenty inches, while in northern Canada moist conditions prevail with fifteen inches or less. The precipitation-evaporation ratio is therefore the best index we have of moisture conditions. Where precipitation exceeds evaporation, moist or humid conditions exist. Where precipitation is less than required to meet needs of evaporation, then dry semi-arid or arid conditions prevail. (1) In this discussion, evaporation includes moisture given off by plants in the process known as transpiration, as well as all moisture directly evaporated from water, land or other surfaces in the area studied.

At times the term "evaporation requirements" is used. This is the total evaporation (including transpiration), or the amount which would be evaporated if the moisture were available. We know that evaporation varies with temperature, and is affected by wind and other factors. While no general statistics are available, as for precipitation, we have considerable information on which to base estimates for the prairie area. Literature from the United States gives a figure of twenty inches for the evaporation requirements of the prairie states bordering Canada. (2) Experience gained by our irrigation engineers, (3) and in the soil moisture experiments conducted at the Dominion Experimental Farm at Swift Current, (4) indicates that we have evaporation requirements of about this amount for our warmest prairie area.

It is recognized that figures for evaporation from an exposed water surface in a dry area, or water applied artificially to grow a crop, will be higher than would be the case if the whole area had moisture to meet evaporation needs. But after discounting figures on this basis it seems certain that eighteen to nineteen inches may be adopted as covering the requirements for our warmest area adjoining the U.S. border. The figure drops quite rapidly as one moves northward in Canada, and thirteen inches to fourteen inches is used for the northern settled area of the prairie. Further explanation in regard to methods used in arriving at these figures, and intermediate values, will be given later.

Moist and Dry Areas of Prairies

Map shown as Figure 1 outlines the general drainage systems of the Canadian prairie. On this map a number of interior basins (about 32,000 square miles) are outlined with hatched borders. In these areas the local streams flow into central lake systems from which water is evaporated, and there is no run-off from the basin outlined. These interior basins are of particular interest in a study such as this, for it is evident that evaporation equals or exceeds precipitation in such areas and that there is some moisture deficiency.

In the interior basins outlined, and in adjoining watersheds, we find many interior drainage basins in miniature, in the typical prairie " slough " or " pot hole ". In these, local drainage is caught in small lakes or sloughs of varying depths and areas, and water evaporated. Sometimes a similarly appearing condition may develop in moist areas where subsoil or bedrock is very porous and water is lost by underground drainage. But, with typical prairie soil and bedrock, the interior drainage basin clearly indicates a moisture deficiency of some degree. While some popular belief exists in underground drainage of the interior lakes, such a belief is not supported by careful study. In other parts of the world, interior basins exist with low points below sea level, proving that seepage loss does not exist under certain conditions.

A study of our lakes and streams reveals great climatic differences between the plains area and the moist areas west, north and east of it: also, that these differences have existed for thousands, probably millions of years. Had there been a period of moisture surplus, the interior lakes and sloughs would have filled to the overflow stage and an overflow channel would be evident. It is the writer's conviction that the plains area entered into a period of semi-arid climate soon after the glacial period, and that such climate has continued with minor fluctuations. Any apparent change, or trend toward permanent change, is extremely small compared with the basic climatic differences between moist and dry areas.

Prairie drainage systems include the Saskatchewan River and branches originating in the mountains — which do not affect conclusions arrived at in this paper. We also have streams such as the Qu'Appelle and Souris with their sources in, or near, the dry area. The record of these streams is enlightening as well as that of our interior lakes. Stream flow records, though not complete, indicate that the run-off taken away from the prairie by these streams equals about .2 inches over their drainage basins. This does not affect the

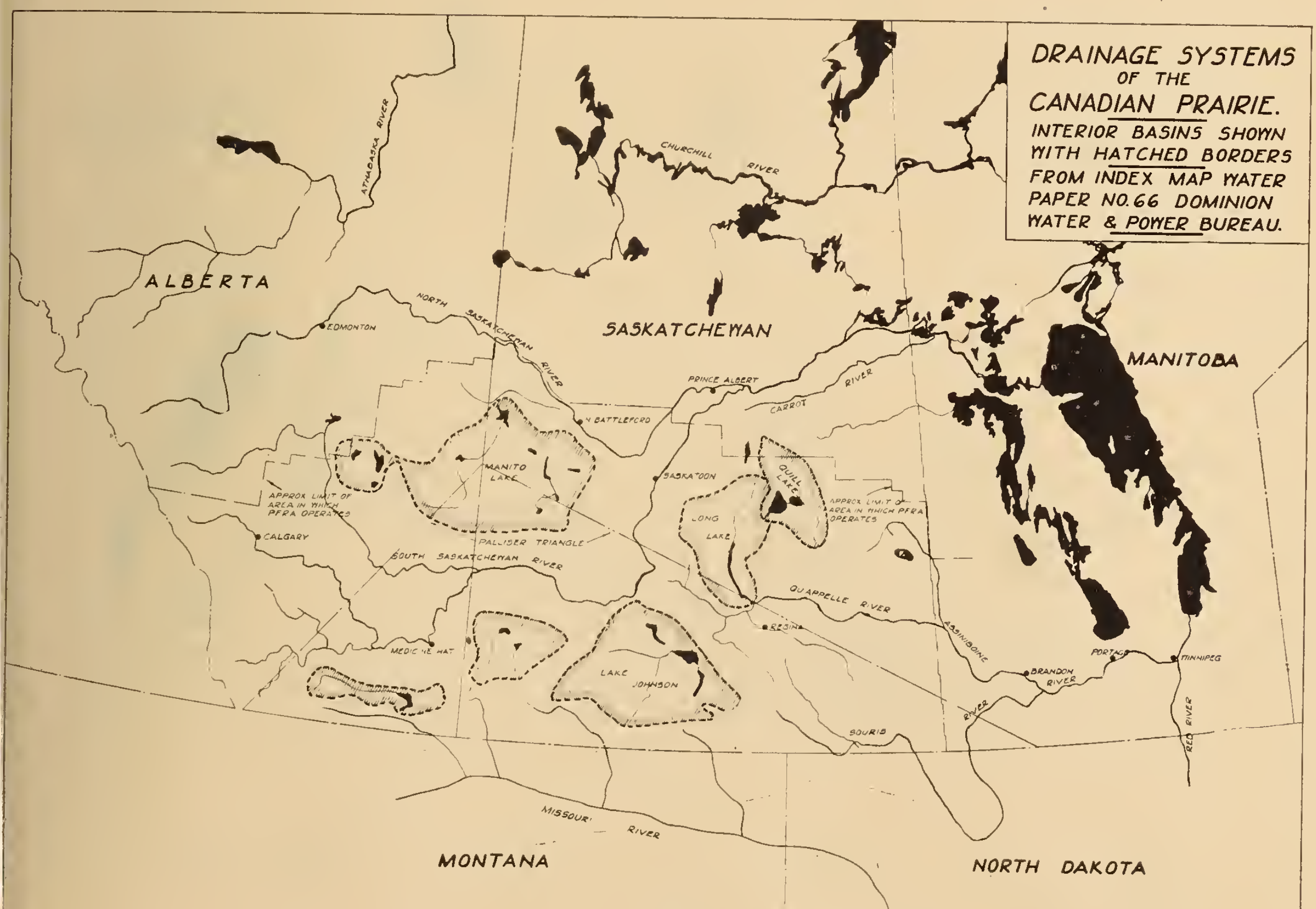


FIG. 1

over-all picture, and may be classed as accidental discharge. The Souris River, as measured at Wawanesa for 1930-31, showed no run off. (5) In the final map these drainage basins are placed partly in and partly outside of the moisture deficiency area.

The difference between the prairie streams and those originating in the moist area is quite astonishing. During the period when an average run-off of .2 inches was measured for Souris and Qu'Appelle Rivers, 7 inches was measured for the Winnipeg River at Slave Falls, seven inches was recorded for Rainy River entering the Lake of the Woods, also for the outlet of Reindeer Lake in northern Saskatchewan, and over 3 inches for the Churchill River at Island Falls. Similar differences in flood stages may be noted. The maximum recorded for Souris-Qu'Appelle rivers is .25 cubic feet per second per square mile. A drainage basin approximately of same area on the Rainy River shows a maximum flood stage of 3.36 cubic feet per second per square mile.

Palliser Ignored Evaporation

On the base map is also shown the frequently mentioned Palliser Triangle. Palliser gave this as boundaries for an area which he considered unfit for settlement, or suitable for ranching purposes only. Even with the bitter experiences of the "thirties" we cannot support that conclusion today, for the triangle includes some splendid farming areas. On the other hand, the interior basins, referred to above, show average moisture deficiency outside the triangle area. The base map also outlines approximate limits of P.F.R.A. activities in Alberta and Saskatchewan. This line is shown for information and is not intended as giving climatic information.

Figure 2 shows the average annual precipitation for the Prairie area, being compiled from the latest tables issued by the Meteorological Bureau. The irregular distribution of precipitation is due chiefly or entirely to the relief features, combined with prevailing winds. The Cypress Hills, near the southern end of the Alberta-Saskatchewan border, bring precipitation of well over 19 inches, while the surrounding prairie area has figures as low as 11 inches. The Indian Head or Moose Mountain Hills, east of Regina, also cause markedly increased precipitation. Figure 3 shows mean annual temperatures for the prairie, this too compiled from latest records available. Other temperature maps have also been compared and show similar characteristics. Temperature, as previously mentioned, is the most important factor in determining evaporation, though wind is also important. Access is not available to data which would provide a similar map covering wind intensity, but records available indicate that it is highest in the high temperature belts.

Space does not permit full discussion of all the study in regard to estimating evaporation requirements for the prairie area, or of linking this with temperature. Figure 4 will illustrate some of the steps taken. On this chart vertical distances represent temperature, while horizontal distance represents precipitation and evaporation. Meteorological records for prairie stations were plotted as follows: "X" indicating stations in dry belts as determined by lake and stream behaviour; open circles indicating stations in moist areas and solid circles indicating border

FIG. 11

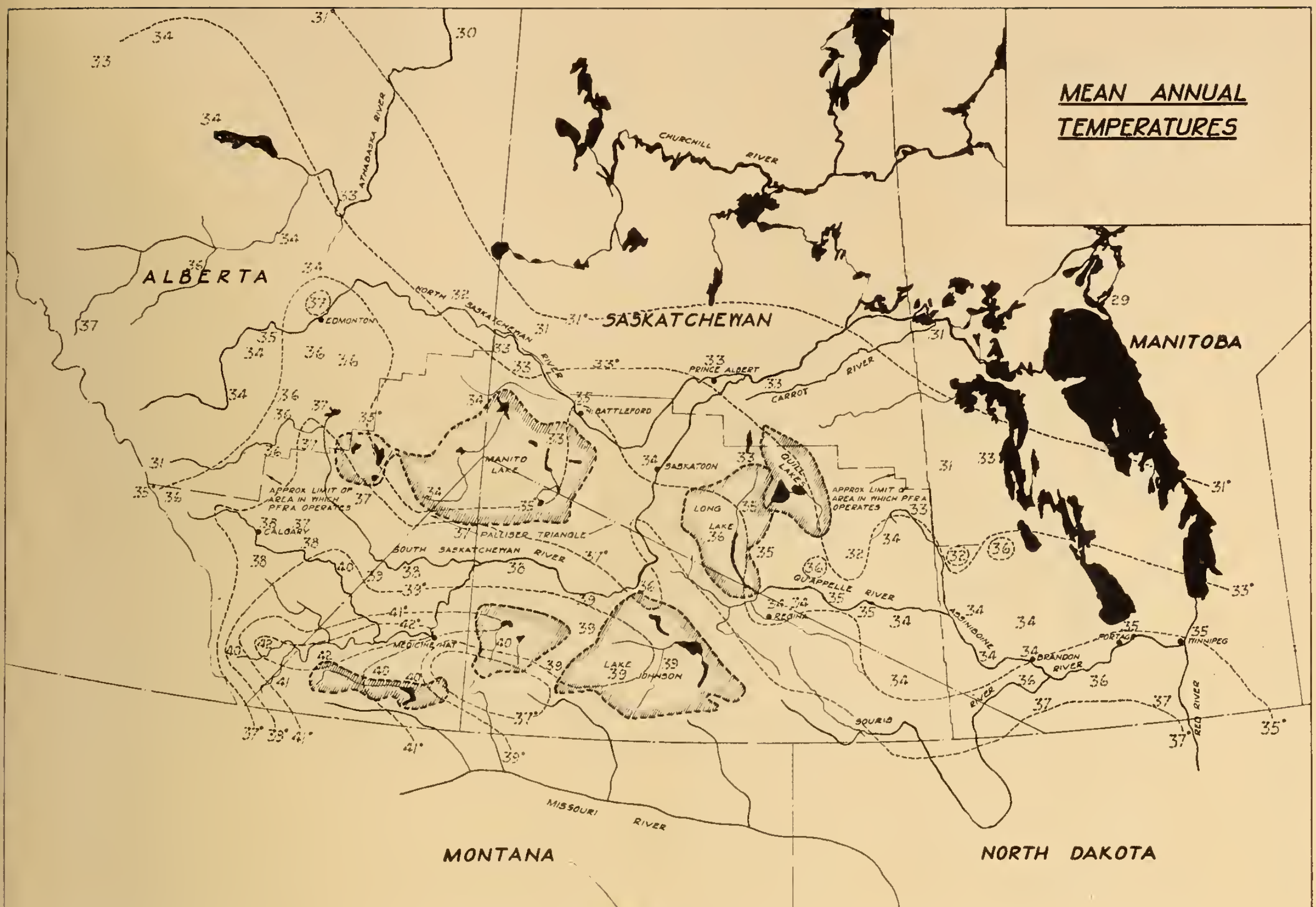


FIG. III

line areas. This plotting alone did not give final location for a line showing where precipitation and evaporation balance, but served as a guide. The final result was affected by considerable other material, such as the Swift Current and U.S. studies previously referred to. With the "evaporation equals precipitation" line established, value for each station could be easily established, the distance between equation line and station point along temperature line, giving the plus or minus quantity. These values were then plotted on a map and final estimated values for precipitation minus evaporation shown in Figure 5.

Some Peace River area stations reflect moisture deficiencies, but the record is short in most cases, and insufficient information is available to chart an area. The records for the town of Jasper indicate a deficiency which would apply only to the valley area around the town, since undoubtedly different records would be obtained in the mountains surrounding this point. Some of those following this discussion may be surprised to see a "dry" area indicated extending so far into the northernmost part of Saskatchewan and over the North Saskatchewan River in central Saskatchewan, but the nature of lakes and streams agrees with other data in support of the boundary shown.

Climate Classification

The system of climate classifications introduced by Dr. W. Koppen of Austria is probably the one most widely used today, with many modifications. In this system the division between "dry" and "moist" climates is based on the relationship of evaporation to precipitation. As described by Trewartha,(1) climate, where precipitation exceeds evaporation, is classified as moist or humid. Where precipitation is insufficient to meet needs of evaporation, climate is classified as dry, arid or semi-arid. Some formulæ are given for the relationship between average annual temperature and evaporation, but the writer has failed to find them applicable to our Canadian prairie area. However, the published maps agree in a general way with findings recorded here. The line "X-X" on map, Figure 5, is taken from the map by E. A. Ackerman, published with his article "The Koppen Classification of Climates in North America", in the January, 1941 issue of *The Geographical Review.*(6) A similar generalized map appears in Trewartha's book. The lines terminating at points "Y" are the boundaries of semi-arid areas under Thornthwaite's classification of climates of the United States. (7)

The question of possible permanent changes in our climatic conditions is an extremely important one. Temperature for North America shows a slight tendency to increase for the period of instrumental record, though this is small, and no one knows whether this is a temporary tendency or part of a long time trend.

There is a marked difference of opinion concerning possible effect of cultivation of the prairie area, but some believe, and the writer agrees, that our cultivation has slightly lowered run-off where meteorological conditions remain the same. Nevertheless any such changes are small compared with the differences which exist. The main climatic characteristics have existed for many thousands of years and will continue for many more.

Dry Belt Is No Desert

It has been pointed out that this is not primarily an agricultural study, and it is strongly emphasized that the area of moisture deficiency is not considered an inferior agricultural area. It is well known that best quality wheat is produced in moderately dry areas. Even quantity is not seriously affected by moderate moisture deficiencies, as grain is produced rather than straw. Weed control is easier in moderately dry climates than in moist ones. Our average distribution of precipitation is nearly ideal for annual crops, especially cereals, the heavier rains coming in May, June and July, with dryer weather for maturing and harvesting. Summer fallow practice still further helps to counteract lack of moisture. It is believed that with good soil and *average* precipitation, summer fallowing would assure fair to good crops in moisture deficient areas down to −3 inches at least.

The "Palliser Triangle" and the line showing boundary of P.F.R.A. activities were not used in determining the results given, but the relationship is interesting to say the least. The P.F.R.A. line in Saskatchewan and Alberta is just outside the area of moisture deficiencies, while the "dry" area is much larger than the Palliser Triangle, the −3 inch line more nearly fitting it.

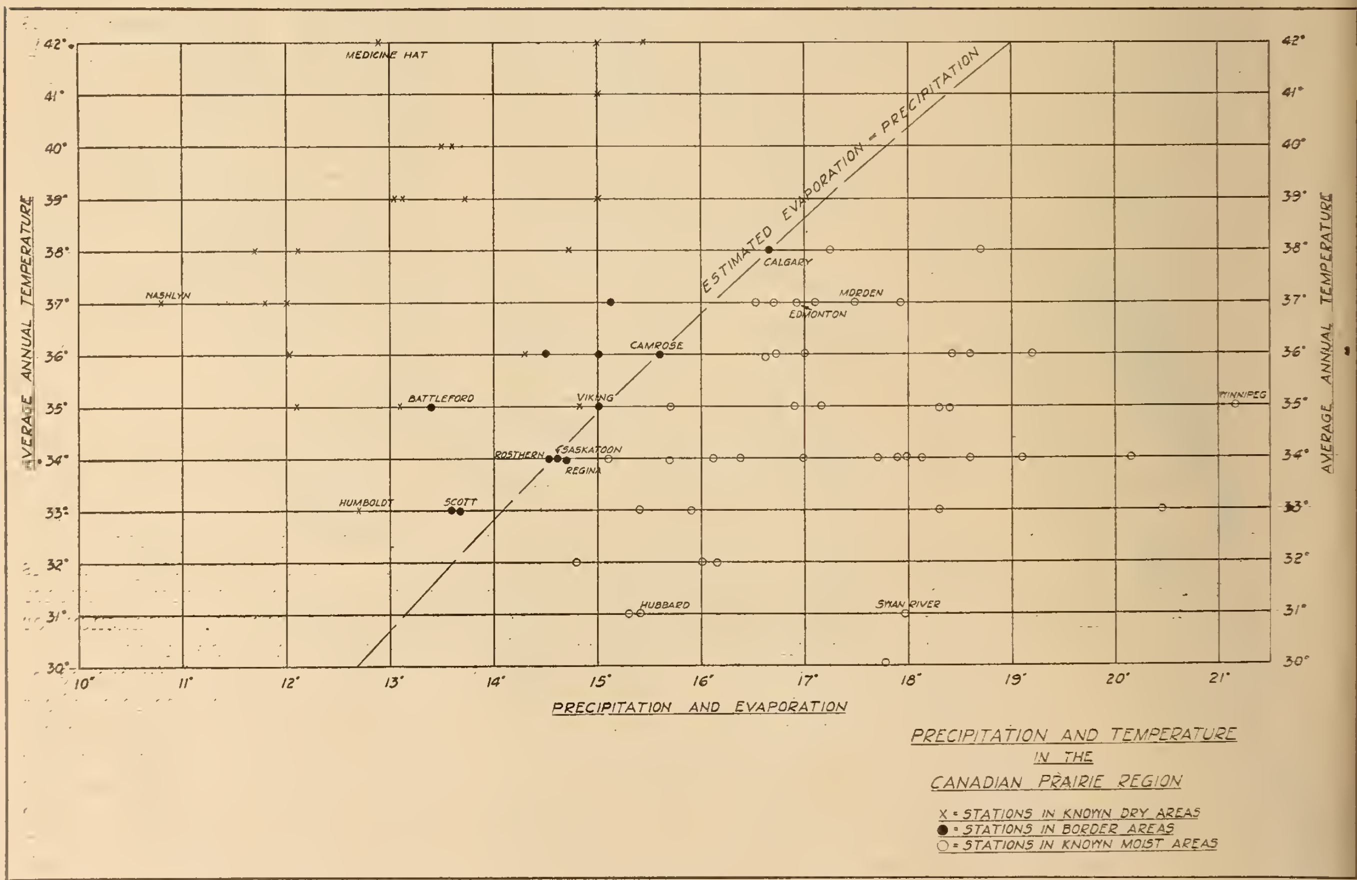
Farming is successfully carried on in a large part of the dry area, this being successful because the dry conditions are known and recognized. Methods employed differ quite markedly from those employed in humid areas. It is equally important that engineers, conservationists and all interested citizens should understand the true conditions. Engineers, especially those interested in hydrological conditions, should remember that conditions differ between dry and moist areas, not only in degree, but in *type*. The moist or humid areas support a fairly uniform stream flow, and a general water table exists in connection with underground water to be found in practically any porous strata. In the dry area, stream flow originating locally is light and irregular, made up of flow that might be called accidental, that is, a very small percentage of the precipitation escaping before it can be evaporated. Ground water, while important, is meagre, and no *general* water table exists.

Effects Of Increased Rainfall

A conception of moisture deficiency and surplus might be further illustrated thus. If precipitation could be increased, where a 2-inch deficiency is shown by 2 inches, and if it came, as at present, in a manner favourable for its use in evaporation; such increased precipitation would have no appreciable effect on surface and ground water supplies. It would, with our fertile soil and other good growing conditions, greatly increase all types of vegetation.

On the other hand, if precipitation were increased by 2 inches in the area where a 2-inch surplus is shown, the increased moisture would all go into surface ground water supplies. The flow of streams would be doubled regardless of regulating influences such

Fig. 4



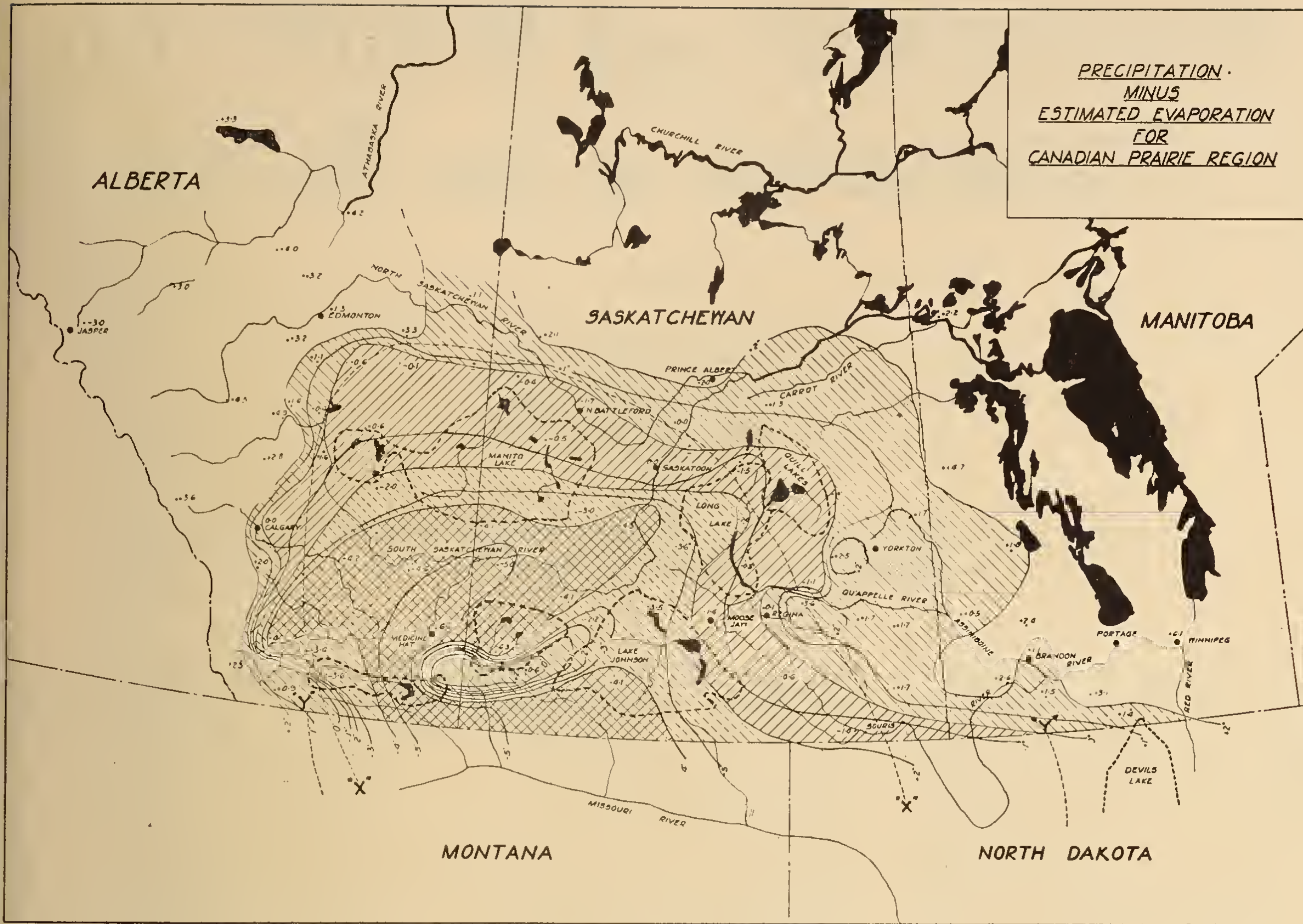


Fig. 5

as lakes and forests. In popular discussions, and in some others claiming technical background, frequent reference is made to the "sponge" effect of forest floor in connection with stream flow. Such discussions fail to take into consideration the effect of pouring more water on a sponge already 100 per cent saturated. It is concluded that climatic conditions far overshadow all others in connection with stream behaviour, and that this should be more generally recognized.

In conclusion, the writer wishes to acknowledge help given by Dr. B. W. Currie of the Physics Department of the University of Saskatchewan, through loan of considerable literature and helpful suggestions. It is not claimed that he endorses the views here expressed, but his help is none the less appreciated. The writer wishes also to express appreciation for the help and encouragement received from some of the members of the Engineering Faculty, and to members of his own staff for work done. He will be much interested in any comments concerning this study. If anything has been done to increase interest in the subject, the effort will be considered well worth while.

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ECONOMIC and POLITICAL PROBLEMS of the RUHR

by

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A paper presented to the Cape Breton Branch of The Engineering Institute of Canada, on April 11, 1949

It affords me a great deal of pleasure to be permitted to address a branch of The Engineering Institute of Canada, for with your Headquarters is connected one of my most cherished exeriences. As president of the graduating class in engineering in 1940 I acted as the spokesman for the McGill graduates, as well as for the graduates from Ecole Polytechnique, at the ceremony where we were presented with the iron rings. I was much older than any of my classmates. I was married and had a family; and the fact that I, a Canadian citizen but of foreign birth and possessing no special qualifications, was elected president of the graduating class, has been to me a symbol of the greatness and strength of this nation.

It has been to me a symbol of democracy. In some circles it has become customary to regard democracy, or to explain what democracy is, by saying that it is a state in which certain undesirable conditions do not exist. To me it is something much more positive. It is, among other things, the assurance to everyone, regardless of race or religion, that the opportunity for useful endeavour exists and that the reward is a fair measure of what the individual puts into it; also that tolerance, understanding, and friendliness form an intimate part of the daily lives, so that work itself becomes no less enjoyable than the receiving of the reward.

I have stressed the positive side of democratic life, but there is a negative quantity of such importance that its presence may destroy the joy of work and the joy of living. That negative quantity is fear. We in Canada do not appreciate what the word really means. We all experience fear of different kinds that may upset temporarily the routine of our daily lives, but we have never experienced the most dreadful fear of all, the fear of aggression.

Defence of Freedom

Our government has taken official recognition of, and commendably swift and thorough action against a possible threat from a foreign nation, by maintaining constant vigilance to prevent infiltration of an undesirable doctrine into our national life. To prevent a direct attack by the nation behind this doctrine, it has signed a defense pact with the United States of America, as well as an Atlantic alliance with many other nations. I wonder if the majority of Canadians realize that their elected representatives in parliament, in advocating and supporting these measures, actually did so in order that freedom from fear might prevail.

From my experiences and observations in Europe during and after the war, I have come to the conclusion that in many countries freedom from fear is practically nonexistent. The western European nations, though admitting the necessity for reactivating Germany to a point where trade can once more flow freely, nevertheless fear the uncontrolled rise of industrial activity, particularly in the Ruhr. Western Germany fears a too severe control by the allied powers which will prevent it from regaining at least part of its economic strength.

In view of past conflicts and present uncertainty as to which role Germany will play in the western European set-up, it appears that the only thing the majority of the people in Europe outside the iron curtain have in common is the fear of Communism. During the difficult years of 1946 and 1947 the Germans in the Ruhr voiced the opinion that it could make very little difference under whom they starved. The question is, does it make any difference to the Germans in whose company they prosper or are they merely waiting to see on whose side they can get the best chance to recover?

Guarantee of Freedom

What can be done to guarantee to western Europe a freedom from fear of aggression by Germany and to guarantee to them all a freedom from fear of aggression by Russia? I believe the only way it can be accomplished is by Germany and France working together to form the nucleus of a united Europe. For a political union to remain sound, the economy must be sound. For the economic strength of western Europe, the Ruhr must produce its quota of coal and steel products.

It has been said that the most effective way to keep Germany weak and prevent it from again waging aggressive war is to give it a weak central government and to take the Ruhr away from it. Why then have not the British and the American governments permitted the Ruhr to be cut loose and given to France or to be placed under international control? Why have they spent hundreds of millions of dollars to reactivate the Ruhr to an extent that coal production is now back to its prewar level? The reason is that the coal and coke of the Ruhr is regarded as absolutely essential for the economic recovery and survival of western Europe, and that a speedy recovery and a guaranteed survival is absolutely necessary to prevent the communistic doctrine from spreading and taking hold.

Monetary Assistance

In spite of what the French and the other European nations might do, the Ruhr would hardly attain the productive capacity of which it is capable, without the full cooperation of the Germans. Even now, with millions of dollars per month being poured into the Ruhr in the form of food and clothing, and for the reconstruction of plants and dwellings to make the coal miner realize that coal exported also brings something back, the output per man shift underground is still below prewar level.

It is difficult to see how the Germans could be made to produce and export required raw material and finished products to re-establish other European countries without the aid of the Marshall Plan, unless they did so on a basis of free enterprise unhampered by German State-control. Allied control on matters of distribution and technical intelligence must of course be retained.

Respect for Anglo-Saxons

The Germans respect the strength of the English speaking nations. In addition, they admire and envy the quiet, unassuming manners of the cultured Britishers and the resourcefulness, aggressiveness and wealth of the Americans. The presence of the Americans and the British is looked upon by the conservatively minded Germans as a protection against left wing socialism and communism, and by all Germans as a protection against any scheme to part the Ruhr from the rest of Germany. How to keep Germany under control while letting it attain industrial strength in the Ruhr is a problem of vital interest to France and the BENELUX countries, which must not be overlooked because of the present threat from the East.

The success attained in the Ruhr in the face of economic and political unrest among the Germans and the demands of present and former allies, is in no small measure due to the efforts of Mr. H. E. Collins, the British joint chairman of the U.K./U.S. Coal Control Group. Mr. Collins, a former lecturer in mining engineering and chief agent of the Doncaster Amalgamated Collieries, has proved himself an administrator, a coordinator of effort and a diplomat of no mean ability. This should prove of some encouragement to the young engineer who entertains ambitions of a political or semi-political nature, and who thinks that law is the only profession through which a political career can be successfully entered.

Coal in the Ruhr

The Ruhr, which has played and is still playing such an important role in the economic and political life of Europe, covers an area about twice the size of Cape Breton, and has a population of 4½ million people. The presence of coal has transformed this area from a rural community to an intensely industrialized district which, in spite of its large and numerous industrial centres with their concentration of groups of mines, coke and by-product plants and steel plants, has retained much of its natural beauty. In a hundred years the coal production has increased from a few thousand tons to 400,000 tons per day.

With the growth of the iron and steel industry an increase in blast furnace coke was required, and when processes were invented in the last part of the 19th century for the winning of tar, ammonia and benzol from the coal, the beginning of a powerful chemical industry was established.

Due to the great depth of the deposits and numerous thin seams, only 8 per cent of total estimated possible reserves are regarded as mineable. At the present rate of production, this will be sufficient for 300 years.

To survive the difficult years after the first world war and the depression period of 1930, a programme of closing down inefficient and the amalgamation of efficient neighbouring collieries was carried out. Furthermore, the importance of close cooperation between steel plants and mines was realized to an increasing extent. Selective and scientifically controlled mining was resorted to in order that the highest quality metallurgical coke might be obtained. Most of the 140 collieries in the Ruhr were owned or controlled by steel plants, chemical concerns and power companies.

Collieries selling only raw unprocessed coal for fuel are few in number, and unless they are mining the smokeless anthracite coal, find it difficult to survive. Coal in the Ruhr is today regarded more as raw material than as fuel. Through its favourable location by the River Rhine and the canal systems which link the interior of the Ruhr with the Rhine, coal can be loaded directly on barges at most of the collieries and iron ore from other countries can be brought directly to the steel plant by water. Coal of the metallurgical type, in a favourable geographic location, with shipping possibilities by both rail and water, is the basis for the industrial importance of the Ruhr.

Coal Used Near Source

The compound industrial activity has enabled a large proportion of the coal to be utilized near the source. Refinement of the coal into coke has left a large quantity of coke-oven gas which, because of the densely populated area, can be distributed by pipe lines to homes and industries. Finally, the close cooperation between the coal and the steel industries has enabled a higher ultimate profit to be obtained. The financial position has been further strengthened by the interchange and compound use of energy.

During the course of my travels in Canada and abroad I have come across few places more richly endowed than Cape Breton with what is required for the building up of a prosperous industrial community. Ample reserves of metallurgical coal, coupled with the iron ore deposits of Newfoundland, already form the foundation upon which a large coal and steel industry can be solidly built. To this can be added the favourable location of iron ore, coal and steel plant which enables the bringing together of

(Continued on page 484)

Notes on Management

A Stalag On Parade

From the London "Times", May 2nd, 1945

When the Guards Armoured Division liberated Stalag XI.B. Regimental Sergeant Major J. C. Lord, Grenadier Guards, was found in effective command of 5,000 British and American prisoners. R.S.M. Lord spent just over six months at Stalag XI.B. Taken prisoner at Arnhem, he arrived soon afterwards with several hundred fellow-prisoners from 1st Airborne Division. He found the prisoners in conditions of chaos and misery. They had tended to succumb to the lethargy that hunger, boredom and squalor so easily lead to. They lived in decay and wretchedness and when they died their bodies were taken almost untended to their graves in an old cart. That was what R.S.M. Lord found; and this is what Major Ralph Cobbold, Coldstream Guards, found when he paid the camp its first visit on the day of liberation.

At the gate was an impressive guard in maroon berets. "We thought that the 6th Airborne Division must somehow have got there first", said Major Cobbold, "but when I asked the Guard commander when he'd arrived, his answer was "Just after Arnhem, Sir". It was faultlessly turned out, that guard. It could have gone on duty at Buckingham Palace and done credit to the Corps.

Then a majestic figure appeared, the R.S.M. himself, with gleaming brass, immaculate webbing, razor-edged trouser creases, dazzling boots, a spectacular salute. As the officers walked with him to his office hundreds of prisoners, though wild with joy of liberation, saluted with precision. In the office he produced chairs and offered cups of tea. Asked for numbers and particulars of the prisoners in the Stalag, R.S.M. Lord rang a bell. "Bring me the personnel files, corporal", he ordered when the door opened, and the fullest details were handed to Major Cobbold.

Passing through the camp, the officers were able to judge the magnitude of the task performed by R.S.M. Lord and his team of Warrant Officers and N.C.O.s., several of them ex-guardsmen. In place of the lifeless confusion of six months earlier, they saw everywhere evidence of the highest morale and discipline. A smoothly-running organization had been worked out and maintained. Daily inspections and guard-mounting, most unpopular when introduced, had restored the prisoners' self-respect and revived their military bearing; and all had been accomplished amid appalling conditions of overcrowding and undernourishment.

Four hundred men were crowded into each hut which had bunks for only 250. To each man only one blanket was allowed, even in the depth of winter. In the cook-house the R.S.M. showed the officers the daily meat ration for nearly 5,000 men—two coal-buckets full of horse-flesh. All who could had to parade for P.T. and this drastic effort of R.S.M. Lord to build up their sinking reserves of strength must have saved the health of hundreds and perhaps the lives of some. When a prisoner died he was given a military funeral with a bearer party, a slow march through the camp and a Union Jack on his coffin. National flags could not be displayed in prison camps; but the R.S.M. always had a Union Jack to cover the coffin as soon as the bearers had borne it outside the compound.

Three times R.S.M. Lord could have given up his task. He and his team were offered a transfer to an N.C.O.'s camp, where conditions were far better. In a body they refused. As British spearheads drove East from the Rhine, a large number of priority prisoners were marched off eastwards. R.S.M. Lord's name was high on the list, but he did not go. He hid himself under the floor of a hut and was fed through a hole in the floor-boards for five days while search parties hunted him. Then he emerged to resume his leadership of the Stalag until he could hand it over to an officer of the advancing British armies. Even when he had done that, he did not leave on the first of the aeroplanes to fly the liberated prisoners back, as he could have done. He volunteered to stay instead and organize the evacuation of his men. "I wanted to see them all out," he said.

❖ ❖ ❖

This extract from the London "Times", was used by Col. L. Urwick, as the basis of a powerful monograph, "Morale", one of a series on Higher Management sponsored by Manchester Municipal College of Technology, Manchester, England.

Col. Urwick is probably the foremost British authority in the field of scientific management. The monograph is an excellent treatment of an important aspect of the subject. It could, with profit, be kept for ready reference on the desk of anyone with a measure of responsibility for the work of others. It was stated in the original printing (1947) that copies could be obtained from the registrar of Manchester College of Technology.

The following extracts will serve to indicate how effectively the author treats this important subject:

What can we as individuals, severally responsible for supervising groups of workers of various grades, do to help in raising the level of national morale?

First, we can try to think a little more consciously and clearly about the subject. Industry hitherto has not paid much attention to morale, or, if it did, it did it unwittingly rather than deliberately. Because the workers were organised in Trade Unions, and officials and shop stewards might be awkward, it tried to avoid courses of action which might "cause trouble".

But we didn't stop to enquire why apparently decent and sensible groups of employees seemed congenitally awkward to manage and were apt to "fly off the handle" in sporadic and unofficial strikes. We didn't ask ourselves whether our methods of management had anything to do with it. We just pussyfooted round trying to keep out of trouble. This was completely useless. It was a negative attitude and negation never gets anyone anywhere. It did not occur to us that morale is a positive quality; it has to be evoked and developed. If we want to have an enthusiastic and energetic and reliable following, then we have got to do something about it—not just sit around and assume that a bunch of workers will behave like a Sunday School because we think they ought to. Why should they, if we do nothing about it?

The root of the trouble was, and is, faulty thinking. That is one of the grounds for hope. In the brave words of David Lilienthal, formerly chairman of the Tennessee Valley Authority:—

> Faith that human personality can flourish side by side with the machine and with science is vital . . . No insoluble physical problems stand in the way. There is no insuperable material barrier. The only serious obstacles are in the minds of men. These are not inconsiderable, it is true, but thinking put them there; a new kind of thinking can remove them.[1]

The basis of this faulty thinking, which has led us to ignore morale in economic relations, is of course the assumption that mankind is ruled by "economic laws" which are automatic. We started at the wrong end, by inventing generaliz-

1—T.V.A.-Democracy on the March, p. 202.

ations about human behaviour instead of observing it in detail. Our fathers sowed a wind of theory and we are reaping a whirlwind of discontent. See where it has led us. A modern factory is a highly complex system of human co-operation. To attain real efficiency it must command from every soul in the undertaking, not only passive acquiescence, but enthusiastic interest, absolute loyalty, and self-disregarding willingness to play for the team. Yet we have set up these intricate emotional structures on the assumption that man is motivated solely by self-regarding impulses. We have relied hitherto for the confidence and discipline necessary to unify and lubricate these delicate social machines on two motives only and those among the lowest—greed and fear .

. . . .

There are other important practical reasons why confusing leadership with domination destroys efficiency. In itself a dominating personality discourages criticism and discussion. But, as has been well said "perhaps the best indication of a good morale is the liberty felt by officials of all grades to tell the truth, both as to the difficulties of the task ahead, and as to the failures that attend its course. . . . The human mind, always apprehensive and trying to decipher the future . . . is chiefly fearful of being protected from the truth".[2] A dominating personality tends to develop "yes-men" who are fearful of saying what they believe to be true because "it will not be liked". It thus exaggerates the very fears which undermine morale.

The individual by himself can contribute but little to the total of any co-operative effort. It is the co-operation that counts. Yet the co-operative effort is only the sum of all the individual efforts. The measure of the effectiveness of any individual exercising authority is the degree to which he can release and mobilize the spontaneous initiative of everyone responsible to him. "However far the orders go, there is always the last touch that cannot be commanded, but can only be given. All the difference between effective and ineffective effort . . . lies in the success of government or command in enlisting this free contribution of the individual to his defined duty".[3] Domination does not release individual initiative; it suppresses it.

. . . .

But a strong element of opinion in our population has been telling the workers for the last half-century that their work was *not* worth while—as long as it was for private capitalists. The greatest force in the world, social opinion, among the workers themselves, has been mobilized consciously or unconsciously, but usually unconsciously, against doing their utmost. The individual who insisted on going his own pace was regarded with the same collective disfavour with which schoolboys discourage the "swot".

Now, suddenly, with the nationalization of certain industries, the whole basis of this disastrous philosophy is brought into the discard. The nation is faced in a moment with the palpable fact that the very lives of all of us are dependent on the degree of effort put out by the men who manage and work in our coal mines. But minds cannot change gear like an automobile at the flick of a legislative finger. Deep-seated social habits cannot be eradicated in a week or a month because the logic on which they are based has lost its validity. They cannot be changed by argument at all. They cut grooves which undermine the most perfect syllogism. They are non-rational.

And what have we who were responsible for capitalist industry done about it anyway? Have we made any serious attempt to make the broad purposes of our undertakings attractive, meaningful, to those who co-operate in them? Generally, we have done less than nothing. Less than nothing because we have actually encouraged the fatal fallacy on which the whole hideous confusion has been erected. Far from explaining to our employees that there was a social purpose, beyond our personal advantage, in making and distributing whatever our businesses might happen to make or distribute, we have actually told them that "business is business", that there are no rules applying to economic activities which they or we need recognize except "the law of the jungle". Far from showing them by precept and example the obvious and simple truth that in our complex modern civilization we are inextricably and increasingly "members one of another", we have lauded an individualism which certainly did not mean "life, liberty and the pursuit of happiness" for every citizen of this lovely land. It was merely an excuse for a licensed piracy in which it was always the crew and never the officers who had to walk the plank.

. . . .

The lesson for industry is surely obvious. Training and tradition, and training through tradition, have we done all we can about these? Have we faced our responsibility as leaders? Or do we still expect to pick up trained craftsmen on the open market to save ourselves the expense of training employees properly? Or do we even know the history of our own undertakings? And in the matter of "telling the boys", don't we flirt tentatively and fearfully with "Joint Consultation", as though our workers were Victorian maidens to be preserved from the facts of life. Or is the real reason for our caution, fear — uncertainty about our own authority so that we shrink from frank discussion of the real issues as a breeding ground for "dangerous thoughts?" We should be wise, if we do, to think again. Training, tradition, bringing the men into the picture, are three of the great weapons open to us to secure morale. We shall never get high productivity in British industry if we do not learn to use them. If we are so afraid of losing our authority that we shrink from playing the part of leaders, we have lost it already. We should make way for better men.

. . . .

Is it not possible that, as we move towards a solution of the long controversy on the objective of industry, as we clear the main ideological obstacle to a higher morale by making it clear that industry has a social purpose, we may yet avoid the bureaucratic alternative?

I believe we may, if management will take to heart the lessons of Stalag XI.B. By devoting itself directly to "morale" it will re-establish the leadership that it has forfeited while raising the production of the individual worker to the level dictated by our necessities.

2—W. E. Hocking, Morale and Its Enemies, p. 21.

3—W. E. Hocking, Morale and Its Enemies, p. 20.

From Month To Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

More Figures on Salaries and Employment of Young Engineers

Recently the Engineers Joint Council of the United States has released a committee report which contains many interesting pieces of information. There is little in this report that will come as a surprise, but it is comforting to have such general agreement with one's own conviction or experience. The decline in the number of graduates given employment is serious but the eventual falling off in the size of graduating classes will offset it to a large extent.

The full report covers twelve mimeographed pages, and gives a great quantity of information beyond what is quoted in this article. There is a small stock at Headquarters and copies may be had as long as they last " for free ".

The survey conducted by the committee endeavoured to cover the following points:

1.—The relative demand for inexperienced engineering graduates in 1948 and 1949.

2.—The 1949 starting salaries for such graduates with bachelors', masters', or doctors' degrees, together with related information on, differentials by curricula or geographical area, credits for military service, and increases during the first year of employment.

3.—The trend of salaries for engineering graduates 10 years out of college since the 1946 survey of the Engineers Joint Council reported in the volume " The Engineer in Transition", is merely an indication of the salary trend for such graduates of some maturity.

Summary of the Findings

Data have been tabulated for 162 industrial companies and 31 governmental agencies with over 4 million employees, of whom almost 90,000 were engineering graduates, or about one-third of an estimated 265,000 such graduates in the country.

These organizations reported that they had hired 10,400 inexperienced engineering graduates in 1948 and estimated that they would hire 8,175, or some 21% less in 1949. For the industrial companies, the decrease was 26% to a total of 5,700; for the governmental agencies, 9% to one of 2,480. Agencies of the state governments actually expected a substantial increase. The estimated employment includes 1066 chemical or ceramic engineers, 1950 civil or structural, 1960 electrical, 2760 mechanical, aeronautical, or industrial, 190 mining, and the remainder scattering.

On the basis of the starting rates reported, 25% of these men at the bachelor's level would receive a starting rate of $275 per month or more, 50% one of $255 or more (the so-called median rate) and 75% one of $250 or more. For those employed by concerns seeking mainly chemical or ceramic engineers, the median bachelor's rate was $290; for those seeking mechanical, aeronautical, or industrial engineers, it was $265; and for those seeking civil, electrical or other engineers it was $250.

The median rates reported by organizations, without regard to the numbers of men to be employed, was likewise $255 for bachelors, $300 for masters, and $375 for doctors. The highest median rates for masters ($310) and doctors ($400) were also offered by organizations seeking principally chemical or ceramic engineers.

A median monthly increase of $30 is given by the end of the first year by the organizations in this group. 45% of them give this total at one time, 49% in two instalments, and the remainder in three or four instalments.

Only 91 organizations provided data concerning the salaries of engineering graduates 10 years beyond their bachelors' degrees late in 1946 and 10 years out late in 1948 and, to some extent, these data represented estimates rather than exact figures. For 1747 graduates 10 years out in 1946, the median monthly salary was $380 and for 1718 who were 10 years out in 1948 it was $440, or 16% more. The 1946 figure corresponds closely with that secured by Engineers Joint Council survey of individual engineering society members at that time, and on that basis the new data for both years may be regarded as reasonably reliable.

Starting Rates

Examination of the data concerning starting rates revealed that very few companies paid different rates to graduates of different engineering curricula and only a limited number used geographical differentials. There were, however, significant variations between the rates paid by organizations employing primarily chemical engineers and, to a lesser extent, mechanical engineers as compared with those paid by organizations employing mainly electrical or civil engineers. The significant factor, in other words, appeared to be the market rate which applied to the major type of engineers sought by a company. Table I, therefore, is set up on that basis.

Salaries of Graduates 10 Years Out of College

In recognition of the fact that many organizations would not have data concerning the salaries of graduates with several years of experience in their organizations readily available, the questionnaire sent out requested current information of this sort only for men 10 years beyond their bachelors' degrees and made it possible to present such data either as an estimate or as the result of a definite compilation. (Table II).

It is interesting to compare the findings of the Engineers Joint Council with the salary analysis and schedule completed recently by The Corporation of Professional Engineers in Quebec. The comparative figures are shown in Table III.

The E.J.C. report was compiled from the reports of 161 industrial companies and 31 government agencies out of total of 500 such organizations canvassed. However, for the figure for graduates with 10 years' experience only 91 of the 192 organizations furnished data. The C.P.E.Q. salary scale was the result of the survey conducted some months ago which obtained usable data from 71 of 96 employing organizations and 1,150 of 3,199 of the Corporation's members.

Of course these figures are surprising. Both the E.J.C. and C.P.E.Q. committees exercised the utmost care in sampling and analysis, and both attempted to make every possible provision for extraordinary variations from the averages. Both reports are believed by their originators to be reliable. If the figures are correct then it would seem that the monetary rewards for engineers in Canada are already greater than in the United States, except in the earliest years, and the Quebec Corporation's recommendations would make them still greater. This should be very interesting to those young Canadian engineers who look upon the United States as a distant field with grass as per the old proverb.

TABLE I

Monthly Base Starting Rates

Engineering Graduates with Bachelors' Degrees

By Principal Curricula Used in Employing Organizations

Principal Curricula	*1949 Quotas*	*Median[1] Upper Half*	*Median[2] Whole Group*	*Median[3] Lower Half*
Chemical or Ceramic	1507	$300	$290	$270
Civil or Structural	2092	260	250[4]	250[4]
Electrical	2328	255	250	245
Mechanical, Aeronautical or Industrial	2182	275	265	250
Other	125	275	250[4]	250[4]
Total	8234	275	255	250

[1]Exceeded (or equaled) by 25% of cases.
[2]Exceeded (or equaled) by 50% of cases.
[3]Exceeded (or equaled) by 75% of cases.
[4]Identical, due to heavy concentration of cases at this rate.

TABLE II

Monthly Salaries

Engineering Graduates 10 Years After Bachelor's Degree

By Principal Curriculum Used by Employing Organization

Principal Curriculum	*No. of Org'ns.*	*No. of Grads.*	*Median Upper Half*	*Median Whole Group*	*Median Lower Half*
Chemical or Ceramic	20	484	$550	$480	$450
Civil or Structural	13	235	450	400	385
Electrical	23	646	425	410	400
Mechanical, Aeronautical or Industrial	34	343	550	500	465
Total	91[1]	1718[1]	500	440	410

[1]Including one Mining with 10 cases.

TABLE III

Definition	Salaries		
	E.J.C. 1949 Minimum	C.P.E.Q. 1948 Actual Minimum	C.P.E.Q. 1949 Recommended Min.
Graduates no exp.	$250.00 p/m	$210.00	$263.00
" 10 yrs. exp.	410.00	473.00*	520.00*

* Obtained by straight line interpolation between grade 5 (9 years' experience) and grade 6 (13 years' experience)

How Many Canadian Engineers Emigrate to the United States?

A recent bulletin issued by the Federal Department of Labour (Technical Personnel Division) presents some interesting information on this question. It is impossible to get complete information upon which to base findings, but the Department does a good job of interpolating and conjecturing so that the report does make sense.

It is interesting and encouraging to find that the exodus appears to be diminishing. Perhaps after all, the advantages in Canada are being appreciated. Perhaps after all, the gilt is coming off the American gingerbread. The figures for each of five cases presented would seem to bear this out. It is to be hoped that this information, or at least the conclusions, will be brought to the attention of engineering classes at every Canadian university. It should have an influence on the thinking of students, to know that the number of engineers now leaving Canada is almost negligible. It should tend to develop greater satisfaction with Canadian conditions —a highly desirable objective.

The *Journal* is publishing only the general information contained in the bulletin. There are several tabulations to support the general conclusions. If any reader wants to see these details they can be secured from Headquarters or the Department of Labour. We quote:

" There is more or less constant speculation as to the extent to which emigration is a factor in the supply of engineers. This matter was last referred to in a Bureau bulletin nearly two years ago and, in the meantime, further information has become available through the publication of certain directories of graduates. As it has been suggested that such directories offer some authentic data dealing with the subject, it appears timely to review the question again.

It may be useful, however, to look first at the other side of the picture, namely, the extent to which immigration may be a factor in overall supply. Some idea of the percentage of those practising engineering in Canada can be obtained by analyzing the present membership of various professional organizations on the basis of place of birth. Such an analysis would have the weakness that it might overlook a substantial number of those with engineering training who are not, at the moment, connected with an organized professional group.

On the other hand, it is possible to get some information on the subject from the study made by the Dominion Bureau of Statistics under the heading " Supply and Demand in the Professions in Canada " based on the 1941 census. This contains a table headed " Distribution of Selected Professional Classes by Birthplace—1941 Census ". A classification by birthplace is given for approximately 231,000 professional workers of both sexes, of whom 195,000, or 84%, were born in Canada. Included in the total are 18,496 in engineering categories, of whom 12,812, or 69%, were born in Canada. The tabulation by birthplace does not include 1,954 who were on active service but, even if it were assumed that all of these were born in Canada, the percentage of Canadian-born would still be only 72%. From this it may be concluded that engineers in Canada are drawn from other countries to a somewhat greater extent than professional workers generally. Engineers, using the higher of the two figures for Canadian-born, would include 19% from the United Kingdom, 5% from the United States, and 4% from Europe and Asia.

Toronto

The first study made by the Bureau of the location of engineering graduates dealt with the University of Toronto. A complete directory published in 1924 showed that 13% of the living engineering graduates from this institution were then in the United States. The percentage was highest among the older age groups. A check made in 1933 showed that, in the case of Toronto, there had been a much smaller percentage of emigration from classes then recently graduated. At that time there were in the United States, less than 5% of the class of 1930 and less than 2% of the class of 1932. The numbers from earlier classes had increased only slightly.

Another comprehensive directory was prepared in 1942 and it showed very little change from 1933 in the proportion of graduates in various classes living in the United States.

Queen's

The latest available issue of the " Proceedings of the Engineering Society of Queen's University ", published in 1947, lists 2,700 graduates in applied science from that university. Of these, 267 are shown as residing outside of Canada, 203 being in the United States and 64 in other countries. The median year of graduation of those in the United States is 1924.

McGill

The Graduates' Society of McGill University has published a " Directory of Graduates—1946 " which includes a comprehensive territorial breakdown of all classes up to and including that of 1946. For this institution it is most convenient to deal with the 15-year period 1932 to 1946 inclusive, as graduates in engineering are clearly distinguishable for those years due to the adoption of the term " Bachelor of Engineering " as a distinctive degree. Of the 1,091 graduates in engineering from these 15 classes, whose addresses were known, 40, or slightly less than 4% were shown as living in the United States.

Saskatchewan

The Engineering Society of the University of Saskatchewan has included in the recently published *Saskatchewan Engineer* for 1949, a list of their engineering graduates. This has been analyzed on the basis of year of graduation and present location. Of slightly under 1,200 living graduates in engineering from this university, no account has been taken of 140 cases in which either the graduating year or the present address was not given. A spot check suggested that the distribution of these 140 would be not unlike that of the graduates whose whereabouts was actually tabulated. The tabulation covers 1,044 graduates of whom 958, or 92% are shown as living in Canada and 8% outside of Canada. Of this 8% about three-quarters are in the United States and the other quarter in various other countries. In the case of this university, the analysis has been split into 3 decennial periods. Of those graduating in the '20s, 21% are shown as outside of Canada. For those in the '30s, the percentage is 10, and for those in the '40s, it is 6.

An exact picture of the relation between immigration and emigration would be difficult of attainment. It would require accurate information on the place of birth and present whereabouts of every individual engineer involved. In general terms, however, it appears safe to assume that, for every 10 engineers graduating in Canada over a long period, opportunities develop in Canada for about 9. In addition, gainful employment has been found by something more than 2 engineers from other countries."

N.S. Tech.

The figures for Nova Scotia Technical College were secured after the bulletin was issued, and will be published later by the Department. Fortunately they were available in time to be included in this article.

Out of 800 living graduates shown in the latest alumni directory 76 are outside of Canada or less than 10%. A breakdown of the figures over ten year periods shows that, here too, the number leaving Canada is getting smaller with the passing of time. For example, of those graduating from 1940 to 1948 totalling 325, only 6, or less than 2%, are shown as being outside Canada. Of these 4 are in the United States. By way of contrast, the figures for the period 1910 to 1919 showed 14 outside of Canada out of a group of 62 graduates, or about 23%.

It is an encouraging picture, and much credit is due the Technical Personnel Division for its study of the subject. There has been much fruitless discussion and some useless argument about the emigration of our young engineers. Now that the record is available perhaps both the discussion and the argument will cease.

"Required Reading"

Under "Library Notes", (page 497) appears a review of the book "A Professional Guide for Junior Engineers", which has just been released by the Engineers' Council for Professional Development.

There is no doubt that this publication is "required reading" for younger engineers, undergraduate engineers, and those who may be contemplating the profession of engineering as a career. So much has been written and said for the guidance and professional development of the novices of the profession that it would not be surprising to find a tendency to regard anything of this nature as "just more of the same old stuff". In this case nothing could be further from the truth.

Dr. W. E. Wickenden, the author of "The Professional Guide," was a professional engineer in the highest sense of that title. He was successful by all the usual standards and was admired and respected by hosts of colleagues and friends. He possessed, in addition, the ability — unfortunately not too common among engineers — to effectively set down his thoughts on paper and this, and future generations of engineers will benefit greatly thereby.

As the review points out, "The Professional Guide" must not be skimmed over lightly. The values which it affords can only be realized by thoughtful study, paragraph by paragraph, and re-reading from time to time by way of review and inspiration.

The Construction Picture in Canada

The following paragraphs have been taken from an address "Construction Outlook Mid-1949" delivered by the president of the Canadian Construction Association, Allan C. Ross, M.E.I.C., *at a meeting held on June 23rd at Windsor, Ontario. They present the Canadian picture very concisely. (Ed.)*

As we approach the mid-year, it is appropriate to consider current conditions as they affect the Canadian construction industry. We are in the fortunate position of being able to present a much more optimistic picture than that now being reflected in our great neighbour immediately across the river. While several economic indicators in the United States have taken a downward trend, including construction activity, Canadian conditions have remained comparatively stable and all indicators point to the maintenance of a high volume of construction.

Contracts awarded during the first five months of 1949 amounted to $386 million compared with $349 million in the same period last year. One of the most encouraging features is that the largest dollar gain has been recorded in the field of industrial construction.

The value of building permits issued in the first quarter of 1949 is 41% greater than the total return for the same period last year. Housing completions are up 54% and housing starts up 26%. The construction employment index is up 8.3%.

Under these conditions, there is currently no evidence to suggest that there should be any revision in the record programme of investment which was forecast for 1949 at the beginning of the year.

In addition to the maintenance of a high volume, there are other bright spots. Material supplies continue to improve, thus reducing costs due to delays in delivery. Offsetting this reduction in costs has been the insistence of labour in many areas on further wage increases. Material costs have been holding fairly steady. The net result is that it now appears that construction costs this year are levelling off and will not likely be much higher than they were towards the end of 1948. The industry and the public have looked forward to this day for some years. It should not, however, be taken for granted that this is the automatic result of economic factors or world conditions. The fact is that, with our comparatively small population, Canada has undergone and will, I believe, continue to undergo a tremendous period of development in which the construction industry plays a vital role.

The Canadian Construction Association gives the leadership which has seen our industry gear itself to carry out a volume of work which a few years ago would have been considered impossible. The work of the Committee on Materials is too well known to need repetition. In the field of labour the C.C.A. has lent every encouragement to veterans' training and the increase of apprenticeship programmes, the benefits of which are now being felt, even though much remains to be done.

In comparing our buoyant conditions with those in the United States, and in mantaining an optimistic opinion of the future, we should not do so with complacency or self-satisfaction. Instead, we should try to study the lessons which may be available to us. One particular note of caution I would sound, and that is the need for continuing every effort to maintain sound labour relations. A factor which has undoubtedly disturbed conditions in the United States is the continuing demand of labour for higher wages and other concessions. American industry has become increasingly concerned as to the ability of the economy of the nation to support such demands. In Canada, we have not been without our labour difficulties, and the need remains for continuing emphasis on policies which will make it possible to sustain a high volume of industrial production and construction. In taking a definite stand on this matter, when short-term thinking might have suggested a quick settlement of their problem, the Toronto Builders Exchange deserves special credit, as do other Exchanges, whose actions may not have been as spectacular, but whose efforts to maintain stability have been, nevertheless, very substantial.

One other lesson I would draw from the American scene. That is the need to avoid panic thinking. It was only a short while ago that leaders in the United States and Canada were warning that the boom conditions of that time must inevitably result in some period of readjustment. Everyone prayed for the day when supply might reach demand. That point has been reached and the day of readjustment is at hand. The situation does not justify much of the pessimism that prevails. While we in Canada are always affected by American conditions, our economic development programme and the potential for the years ahead are too great to justify the pessimism which could bring about a psychological recession or depression. We must be on our guard to avoid any such possibility when our own period of readjustment arrives.

Supply of Mining Engineers

(From The Quarterly Bulletin of the Technical Personnel Division, Dept. of Labour)

The principal source of all types of engineers is found in the graduating classes from Canadian universities. From 1920 until 1942 inclusive the number receiving degrees in mining engineering never fell far short of 10 per cent of the total. In 1943 it was about 8 per cent and since that time (up to 1949 incl.) has been averaging somewhat less than 5 per cent.

In its annual statement of registration in engineering at Canadian universities, the Engineering Institue of Canada *(Engineering Journal* Dec. 1948) gives the total of all students in engineering at 13,063. Of these 3,414 are shown in general courses, not having elected a particular branch of engineering. Of the 9,649 students already enrolled in separate branches only 428 had chosen mining engineering. This is about 4.4 per cent and covers students up to the class of 1952 inclusive.

This shows that over a ten-year period there has been a marked falling off in the popularity of this course as a choice in potential graduates. Taking into account the total number of mining engineers in the country and their ages, it would appear that there is some danger of the new supply falling below the figure which would look after replacements made necessary by death and retirement without taking into account any needs for expansion.

This matter was discussed by one of the Division's officers at the 1949 annual meeting of the Canadian Institute of Mining and Metallurgy with representatives of engineering schools, the mining industry, and provincial departments of mines. There was a considerable measure of agreement that the possibilities in this branch of engineering should be given more attention at counselling level and that present activities along these lines might well be intensified.

Some relief for a possible shortage of mining graduates may be provided by the use of a certain number who secure degrees in other branches and will be available for functions that have been, to some extent, carried out by mining engineers. Among such courses are metallurgy, petroleum engineering and mining geology.

Demand for New Graduates in 1949 and 1950

The 1949 graduating class in engineering is almost 3 times the normal size which would be arrived at from a study of long-term trends. It comprises roughly 1,000 students who have come straight on from secondary schools and 2,200 who are veterans. It is pretty generally realized that the actual placement of this abnormally large number would require considerable time and effort on the part of all concerned regardless of how favourable the employment market might be at the time.

In order to check progress in this regard a sampling was made at the beginning of May covering 3 universities in central provinces and 4 in the western provinces. This was done through the co-operation of university employment officers and field officers of the National Employment Service. It was found at that time that the percentage placed varied from 70 per cent at one university to 93 per cent at the one reporting the highest figure. From this it might be assumed that roughly 80 per cent of the engineering graduates in Canada had made satisfactory arrangements for employment by the beginning of May. This would be a good showing even in a year of normal enrolment as there are always a limited number of students, and perhaps of employers, who carry on negotiations after the session has finished.

The class of 1950 in engineering will be even larger than that of 1949 (approximately 3,500) and it will also have the highest percentage of veterans of any of the postwar classes. It is possible that at least a few employers will have concentrated so heavily on recruiting new graduates in the years up to 1949 that they will not be in a very good position to absorb large numbers in 1950. To get some idea of the situation a follow-up is being conducted on the visits to employers made in 1946 during the survey of professional openings in Canada. The field work in this project is being undertaken by the Executive & Professional Divisions of the National Employment Service. From this "re-survey" only partial returns have been received but they constitute a fair sample of some of the larger employers of engineers. It is quite evident that a few employers have scaled downwards the estimates they made 3 years ago regarding their needs for 1950. There are however a sufficient number of employers who have increased the original estimate to more than offset the decreases. This applies both in engineering alone and in the larger total of all types of professional training.

From this it might be concluded, subject to revision on further returns coming in, that the estimates made in the winter of 1946-47 are still valid as they may affect the class of 1950. Bearing in mind that all forecasts made by employers both in 1946 and 1949 are based on the maintenance of a stable employment market, it would appear that something like two-thirds of the 1950 graduating class in engineering might now be considered as having employment available on graduation. For all or part of the remaining one-third, employment will depend on the extent to which further opportunities can be developed or uncovered. The various agencies concerned have already initiated appropriate action in this regard.

Year of Graduation	Median Starting Salary
1946	$2,150
1947	$2,350
1948	$2,440
1949	$2,550

Starting Salaries for New Graduates

The upward movement in starting salaries may be indicated as follows:

% Starting at $2,400 or more	Upper Limit of Lowest 10%
10	$1,800
40	$2,100
55	$2,100
76	$2,260

British Achievement

Recently the thirtieth anniversary of an event of great importance to engineers passed almost unnoticed. The first machine to cross the Atlantic Ocean in a single flight was of British design and manufacture, flown by two Englishmen, Alcock and Brown. They did it in 1919. Today, if you asked the average person who it was that first accomplished this feat, he would say it was Lindbergh; and yet that so well-publicized event did not take place until eight years later.

It was on June 14th, 1919, that Captain John Alcock, D.S.C., and Lieutenant A. W. Brown, a professional engineer took off from Newfoundland and landed sixteen hours later in Ireland. Alcock was the pilot and Brown the navigator. They flew in a reconditioned Vickers "Vimy" aeroplane in which they sat in an open cockpit. The power plant comprised two Rolls-Royce "Eagle" engines of 350 hp. each.

The conditions were far from favourable, except that they had a following wind. Practically the whole route was choked with fog and low-lying clouds. Brown was able only four times to check his position by astronomical observations. The generator of their wireless set failed soon after take-off so they had no communication with ships as an alternative check. Also they were bedevilled with ice which Brown removed by climbing out on the wings. The whole story from beginning to end is one of almost unbelievable courage and determination, and of ingenuity on the part of those British engineers who still lead the world in aeronautics.

The speed at the time seemed wonderful—1880 miles in 15 hours, 57 minutes. This was an average of 118 m.p.h., although Alcock had throttled the engines to an indicated airspeed of 90 m.p.h. to conserve gas. The favourable wind was a real aid.

The anniversary was not allowed to pass quite unnoticed. Trans Canada Airlines flew a memorial flight over the same route, in the incredibly short time of less than eight hours. The Montreal Gazette marked the occasion with an editorial. John Fisher of the C.B.C. made reference to it in a regular Sunday night broadcast. Perhaps there were others too, but certain it is that the anniversary of this epic event went by insufficiently acknowledged.

Both men were knighted by the King but British modesty has permitted the world to forget—if it ever knew — this outstanding achievement of British courage and British engineering leadership. The dusty record is full of similar experiences. Here in Canada we know too little of what goes on in the Commonwealth; thus depriving ourselves of pleasure and satisfaction, and perhaps too, of inspiration.

It is interesting to note that the well known British publication *Engineering*, in commenting on the Alcock-Brown achievement in the issue of June 20, 1919, stated "In our view lighter-than-air craft as represented by large sized airships are more suitable for long journeys over the seas and these we think are more likely to become a commercial proposition".

"Canadians as Consumers"

Under this title the Department of Trade & Commerce, Ottawa, has published recently an extremely attractive and informative booklet. It was prepared principally for distribution last May at the British Industries Trade Fair and is a companion piece to "Canada Produces" which was used at last year's fair.

Although the contents are principally illustrations there is enough text to join the various parts into an intelligent whole. The presentation should do a lot in England and elsewhere to inform observers as to the state of our civilization.

The Department is to be congratulated. This is a nice piece of propaganda and promotional work worthy of the people and the country of which it speaks. There are copies available for distribution in Canada at 25c each from the King's printer.

Correspondence

Montreal, July 19, 1949.

The Editor:

Mr. J. G. G. Kerry's letter to you, appearing in the March issue of the *Journal*, closes with the thought that the opportunity of defending his opinions at greater length than the columns of the *Journal* will permit would be welcomed; so perhaps one may be permitted to take exception to some of the statements which his letter contains.

Mr. Kerry is so widely known as a keen student of problems associated with the proposed St. Lawrence Waterway that some portions of his letter are rather surprising; for many of the questions which he raises already have received attention. For example: heat losses, water temperatures and the possibility of providing an ice-free channel were investigated quite fully by the Joint Board of Engineers, which also studied the regulation of lake levels intensively, devoting upwards of 150 pages to this particular problem in its report dated November 16, 1926, and made available to the public early in 1927.

As a matter of record, the normal heat loss from Lake Ontario is such that water temperatures near the outlet approach the freezing point by the end of February; and there appears to be little possibility that any of the schemes advanced by Mr. Kerry would provide ice-free navigation from Lake to Gulf. Even if such a channel could be provided, there still would remain the problem of keeping the locks and still-water basins ice-free also. Moreover, increasing the depths of the excavated portions of the channel would give rise to corresponding increases in lengths and widths, so that excavation costs would be absolutely prohibitive.

Mr. Kerry's letter is thought-provoking and interesting but the undersigned cannot agree with his criticism of the manner in which the investigation of the St. Lawrence has been carried out.

H. M. Finlayson, M.E.I.C.

News of Other Societies

The **Canadian Electrical Association,** Room 704, Tramways Bldg., Montreal 1, announces 1950 meetings as follows: the annual winter conference at Quebec, January 16, 17, and 18; and the annual convention at Murray Bay, Que., June 15-19.

The **Chemical Institute of Canada** has announced that officers for the year 1949-50 are as follows: president, Dr. E. W. R. Steacie, F.C.I.C., National Research Council, Ottawa, Ont.; vice-president, Dr. S. A. Beatty, F.C.I.C., Fisheries Experimental Station, Halifax, N.S.; chairman of board, Dr. A. S. Cook, F.C.I.C., Ayerst, McKenna & Harrison Ltd., Montreal, Que.; treasurer, Mr. R. H. Rimmer, F.C.I.C., Aluminum Laboratories Ltd., Kingston, Ont.; general manager and secretary, Mr. Garnet T. Page, M.C.I.C., 18 Rideau Street, Ottawa, Ont.

The next Annual Conference of The Chemical Institute of Canada will be held in the Royal York Hotel, Toronto, Ontario, June 19-22, 1950.

The 116th national meeting of the **American Chemical Society** (60 East 42nd St., New York 17, N.Y.), will take place at Atlantic City, N.J., from September 18 to 23.

November 1-5, 1949, at San Francisco, Cal., the Pacific Industrial Conferences will take place concurrently with the Pacific Chemical Exposition at the San Francisco Civil Auditorium.

Information can be obtained from the California Section, **American Chemical Society,** Hotel Whitcomb, San Francisco 1, Cal.

The Montreal regional conference of the American Institute of Chemical Engineers, September 7, 8 and 9, 1949, will be held at the Mount Royal Hotel. Dr. H. R. L. Streight, P.O. Box 10, Montreal is secretary of the local committee on arrangements.

The annual meeting of A.I.Ch. E. for 1949 will be at Pittsburgh, Pa., at the William Penn Hotel, December 4-7.

The fall meeting of the **American Society of Mechanical Engineers** (29 West 39th St., New York 18, N.Y.), is scheduled for September 28-30, at Erie, Pa.

The Society's annual meeting will be in New York, November 27 to December 2, 1949.

The ninety-sixth convention of the **Electrochemical Society** (235 West 102nd St., New York 25, N.Y.), will be held at the La Salle Hotel, Chicago, Illinois, on October 12, 13, 14 and 15, 1949.

The mid-west general meeting of the American Institute of Electrical Engineers (33 West Thirty-ninth Street, New York 18), will take place at the Netherland Plaza Hotel, Cincinnati, Ohio, October 17-21, 1949.

The first Pacific area national meeting of the **American Society for Testing Materials** (1916 Race St., Philadelphia 3), is scheduled for October 10-14, 1949, at San Francisco, Calif.

La Societe de Chimie Industrielle, 28 rue Saint-Dominique, Paris VII^{e}, France, advises of plans for the 22nd International Industrial Chemistry Congress at Barcelona, Spain, on October 23-30, 1949.

ECONOMIC AND POLITICAL PROBLEMS OF THE RUHR

(*Continued from page 475*)

the raw material with a minimum of costly rail haulage. The present organization has at its disposal engineers and operating officials of as high a calibre as can be found anywhere.

A Comparison

As for the Cape Breton worker, I have found him most friendly, willing and capable. I came back from Germany full of admiration for the "Glüch Auf" greeting used by all members, high and low, of the mining fraternity in the Ruhr, but the friendly response one gets from a simple "Good Day" from the Cape Bretoner has a lot more in it.

I believe that Cape Breton has everything that is required to make it industrially much more important than it is today. For this to be realized, everybody has to believe in it and everybody has to work for it.

Quite apart from the growing importance of Cape Breton in an expanding national economy, it would seem that an expansion of the present steel industry and possibly the establishment of a plant for the manufacture of synthetic gasoline from coal would be the logical outcome of the Atlantic Defence Alliance. I can think of no organization better qualified to look into these possibilities and bring the facts before the responsible authorities than this branch of The Engineering Institute of Canada.

Personals

Notes of the Personal Activities of Members of the Institute

R. Lloyd Parsons, M.E.I.C., was elected chairman of the Moncton Branch of the Institute at the recent annual meeting of the Branch. He is construction engineer of Parsons Construction Com-

R. Lloyd Parsons, M.E.I.C.

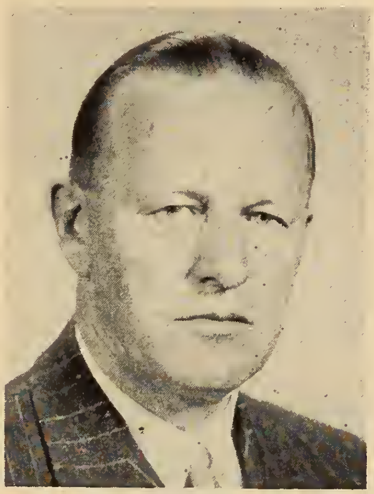
pany Limited, contractors and engineers, of that city.

Mr. Parsons is a native of Moncton, and a graduate of Mount Allison University, Sackville, N.B., and of Nova Scotia Technical College, Halifax, having received from the latter in 1944 the degree of bachelor of engineering. He was associated with the Parsons Construction Company Limited before and since his graduation, and has been identified with many projects of the firm. He was named its executive secretary-treasurer and construction engineer in 1946.

H. M. Olsson, M.E.I.C., chief engineer of C. D. Howe Co. Ltd., Port Arthur, Ont., is the newly elected chairman of the Lakehead Branch of the Institute.

Mr. Olsson came to Canada from Sweden in 1925. There he had studied engineering at Strelitz, graduating as a building engineer in 1925.

He was first employed in Winnipeg by Carter Halls Aldinger Co. on building construction, and he was on the Winnipeg staff of Dominion Bridge Company for a time in 1926. He went



H. M. Olsson, M.E.I.C.

N. A. D. Parlee, M.E.I.C.

at the end of that year to the C. D. Howe Company and remained until 1931. In 1934-35 he was employed by Macdonald Engineering Co., Toronto, and by Anglin, Norcross, Toronto, after which he rejoined C. D. Howe Company to do design on reinforced concrete and structural steel. He has remained with the Company, and in 1936 received the title of designing engineer. He was later appointed chief engineer.

John W. Brooks, M.E.I.C., who was elected, recently, chairman of the Kingston Branch of the Institute, is associate professor in civil engineering at Queen's University.

Mr. Brooks is from London, Ont. He graduated with honours in civil engineering from Queen's in 1939, and for two years he was demonstrator and lecturer in civil engineering there. He then went to H. G. Acres and Company at Niagara Falls, Ont., and from there to the Spruce Falls Power and Paper Company at Kapuskasing, Ont. He received his appointment at Queen's in 1947.

From 1942 he has served, at the Institute's request on the junior division of the Committee on Professional Training of the Engineers' Council for Professional Development.

Dr. N. A. D. Parlee, M.E.I.C., director of research for Dominion Steel & Coal Corporation, Sydney, N.S., has been elected chairman of the Cape Breton Branch of the Institute.

Dr. Parlee was born at South Farmington, N.S. He entered Dalhousie University in 1930 and graduated in 1935 with a B.Sc. in chemistry. Awarded a National Research Council bursary in 1936, he carried on research at Dalhousie on reaction kinetics, this work leading to the degree of M.Sc. in physical chemistry in 1937. He was awarded a National Research Council bursary in 1937 and a studentship in 1938, which were held at McGill University. There he specialized in physical chemistry and did research on atomic reactions and received a Ph.D. degree in 1939.

Dr. Parlee joined Dominion Steel and Coal Corporation at Sydney that year, and held positions as analytical chemist, metallographer, research chemist and assistant chief metallurgist, before being appointed to his present position.

J. W. Brooks, M.E.I.C.

Fred Webster, Hon. M.E.I.C., has joined the firm of Richard Costain Limited, London, England. He was formerly with the Ministry of Works in London.

Lt.-Col. L. F. Gront, M.E.I.C., past president of the Institute, skippered the "*Tramp Royal*" to win the "big boat" class race on July 15 in the annual regatta of the Eastern Yachting Circuit, at Chaumont Bay, N.Y. "*Tramp Royal's*" time for the triangular course was 1 hr. 28 min. 14 sec.

Captain A. C. M. Davy, M.E.I.C., has been appointed deputy chief of naval technical services and engineer in chief at Naval Headquarters, Ottawa, duties which he assumed August 1. Captain Davy was wartime director of shipbuilding for the Royal Canadian Navy, which he joined in 1917.

F. A. Brownie, M.E.I.C., is president of the Canadian Western Natural Gas Co. Ltd., Calgary, and of Northwestern Utilities Ltd., Edmonton, Alberta. His appointment was announced recently.

Born in Montreal in 1908, Mr. Brownie joined the Northwestern Company in 1935, a year after graduating from the University of Alberta with a B.Sc. degree.

He is immediate past president of the Canadian Gas Association, and a member of the executive committee and vice-president of the Association of Professional Engineers of Alberta.

Alan Turner Bone, M.E.I.C., formerly vice-president and chief engineer of J. L. E. Price and Company, Limited, Montreal, has been elected president of the Company, succeeding to the position of the late J. L. E. Price, M.E.I.C.

Mr. Bone has been associated with J. L. E. Price since 1932. He was born in Scotland, but was educated in Canada, and graduated from McGill University in 1916. He was in Halifax for three years on the construction of the Halifax Ocean Terminals, and from 1919 to 1922 he was with the George A. Fuller Company in Moncton, Temiskaming, and Montreal as field engineer and estimator. Six months were spent with A. F. Byers & Co. Ltd., as estimator, and then in 1922 he joined the Shawinigan Engineering Co. Ltd., as job office engineer on the construction of the development at La Gabelle. From 1924 he was with the George A. Fuller Company of Canada Limited in Toronto, Ottawa, and Montreal, as superintendent and assistant construction manager, following which he became construction manager of their Montreal office, retaining that position until his association with the J. L. E. Price Company.

E. D. Gray-Donald, M.E.I.C., was elected president of the Canadian Electrical Association at the conclusion of the Association's 58th annual convention at Banff Springs Hotel in July. Mr. Gray-Donald is chief engineer of the Quebec Power Company and the Quebec Railway, Light and Power Company. He is a councillor of the Engineering Institute of Canada.

E. R. Jacobsen, M.E.I.C., recently returned from a four months trip around the world on behalf of the United States Steel Export Company, New York. He visited subsidiaries in Pittsburgh and on the West Coast and proceeded to New Zealand via Australia to Singapore & Malaya, thence to Ceylon and India, and back via London

J. Clark Keith, M.E.I.C., was, in June awarded the 1949 Fuller Memorial Award of the American Water Works Association. The citation reads, "For outstanding administration and engineering service in the waterworks field and other public utilities; for long and constructive interest in A.W.W.A. affairs as well as outstanding service to other engineering and professional associations in Canada".

Mr. Keith is the general manager of the Windsor Utilities Commission, Windsor, Ont.

John Narsted, M.E.I.C., has been appointed vice-president in charge of production for Canada Cement Co. Ltd., Montreal.

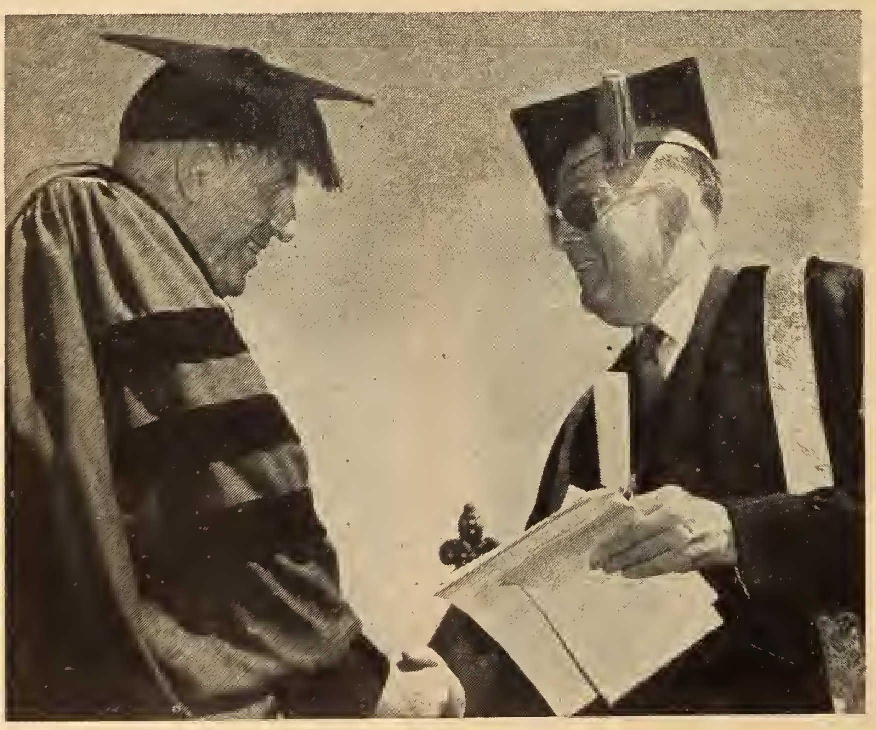
Mr. Narsted, was formerly general operating manager of the Company, which he joined in 1920. He was successively mechanical and field engineer and assistant chief engineer, until his appointment as chief engineer in 1935, with charge of all engineering work of the Company. He was appointed general superintendent and chief engineer in 1942, adding to his previous responsibilities supervision of plant production operations.

John Narsted, M.E.I.C.

Commander (E) T. Fife, M.E.I.C., R.C.N., is on loan to the joint Inspection Services, Department of National Defence, Ottawa, as chief inspector of ships. The joint Inspection Services have succeeded the Inspection Board of the United Kingdom and Canada, and have been reorganized under the controllership of Mr. W. G. Mills, who is assisted by a senior officer from each of the three services.

Commander Fife's work will be in connection with the production and inspection of the diesel electric icebreaker, and with the fast escort vessels which have recently been announced. He was previously manager of the engineering department of the Halifax Dockyard.

E. Holt Gurney, M.E.I.C., president of the Gurney Foundry Company Limited, and chairman of the Ontario Research Council, is shown receiving an honorary degree of LL.D. from the University of Western Ontario, at a recent convocation. In his address, Dr. Gurney stressed the need in Canada for post graduate work in the scientific research field.



N.S. Highways and Public Works Appointments

Major changes in organization and personnel of the Nova Scotia Department of Highways and Public Works were announced recently:

J. E. Belliveau, M.E.I.C., has been appointed deputy minister of highways and public works. He entered the service of the Province of Nova Scotia in 1909, as an assistant engineer in what was then known as the provincial engineer's office. He was appointed assistant chief engineer and bridge engineer in 1918 when the Roads Department was reorganized. He was promoted to chief engineer of the Department of Highways and Public Works in 1939.

J. L. Wickwire, M.E.I.C., succeeds Mr. Belliveau as chief engineer of the Department. He studied engineering at Dalhousie and McGill Universities graduating from the latter as a bachelor of science and civil engineering in 1924. From that time until 1933 he was engaged in engineering work in Montreal and western Canada. In 1933 he joined the Department of Highways as division engineer of maintenance in Kings, Annapolis and Digby counties. In 1941 he was appointed assistant chief engineer of the Department.

Gordon S. Stairs, M.E.I.C., who becomes assistant chief engineer, received his engineering training at Dalhousie University and the Nova Scotia Technical College, graduating with the degree of B.Sc. in civil engineering in 1911. He was employed on various engineering projects in western Canada until 1917 when he was commissioned as a lieutenant in the Royal Canadian Engineers. After the First World War and until 1928 he was successively assistant engineer with the Halifax Works Department, town manager and engineer in Wolfville and Windsor. Beween 1928 and 1934 he served with L. E. Shaw Limited and the Dominion Bridge Company. He was resident engineer with the Department of Highways from 1934 to 1940, when he joined the Royal Canadian Air Force as an engineer. He returned to the Department in 1945 as division engineer of construction.

E. A. Crawley, M.E.I.C., who has been named division engineer of construction, was educated at Acadia University, after which he was employed as an engineer with the Trans-Continental Railway and the Greater Winnipeg Water District. After serving overseas in the First World War he joined the Department of Highways. Between 1924 and 1935 he was employed on engineering projects in various parts of Canada and Mexico but in the latter year returned to the department as a division engineer. He was division engineer of maintenance in Kings, Annapolis and Digby counties prior to his recent appointment.

W. C. MacDonald, M.E.I.C., the Department's new district engineer of maintenance for Kings, Annapolis, and Digby counties, was educated at St. Francis Xavier and Dalhousie Universities. Between 1907 and 1914 he was resident engineer of construction with Canadian National Railways and later with Canadian Pacific Railway. In the period from 1914 to 1937 he was consulting engineer with several large contracting firms and engaged in engineering and contracting work in the West Indies. He was district engineer with the New Brunswick Department of Highways from 1937 to 1940, when he become Maritime district engineer with the Department of Transport.

E. G. Dyer, M.E.I.C., who becomes division engineer of construction, graduated with the degree of bachelor of science in civil engineering from Nova Scotia Technical College in 1933. From 1933 to 1940 he was a resident engineer with the Department of Highways. During the Second World War he was engaged in engineering work with the Department of National Defence, rejoining the Department of Highways as a resident engineer in 1946.

The Board of Research on the Traffic and Transportation Problems recently constituted to study the traffic and public transportation problems of the city of Montreal, includes a number of the Institute's Montreal members:

H. A. Gibeau, M.E.I.C., director of Montreal's Public Works Department; **J. Cecil McDougall,** M.E.I.C., of McDougall Smith & Fleming; **Ignace Brouillet,** M.E.I.C., director of Ecole Polytechnique; **Ernest Cormier,** M.E.I.C., engineer and architect; **Gordon McL. Pitts,** M.E.I.C., of Maxwell & Pitts, architects, vice-chairman of the Traffic Board; **Huet Massue,** M.E.I.C., statistical engineer of Shawinigan Water and Power Company; **Jules Archambault,** M.E.I.C., chief engineer, Montreal Tramways; **Aime Cousineau,** M.E.I.C., director, City Planning Department; **J. E. Armstrong,** M.E.I.C., chief engineer of the Canadian Pacific Railway, and president of the Institute.

W. St. J. Miller, M.E.I.C., recently joined the firm of Fetherstonhaugh and Company, patent attorneys at Calgary, Alta., as local manager and representative. Mr. Miller has practised in that field for a number of years in Calgary, and has been active in the affairs of the Calgary Branch of the Institute.

W. St. J. Miller, M.E.I.C.

L. B. Elliott, M.E.I.C., retired in June after forty years of service with the engineering staff of the Federal Department of Public Works. He has been located at New Westminster, B.C., since 1921, and has been "second in command" in the district engineer's office for a number of years.

Mr. Elliot, joined the government service after graduating from Dalhousie University in 1903. He was stationed at Calgary and later at Edmonton, Alberta, before being transferred to New Westminster in 1921.

Jacques Benoit, M.E.I.C., is associated with H. W. Lea, consulting engineer, in Montreal. He has been previously for fifteen years in the service of Wallace & Tiernan Limited, and for the past twelve years was district sales manager in Montreal.

F. G. F. Barr, M.E.I.C., has been named district traffic superintendent for the London District, Ontario, by the Bell Telephone Company of Canada. He was previously in the Kitchener, Ont., district of the Company. He had been active before this transfer in the formation of the new branch of the Institute at Kitchener, and was its provisional chairman.

Carleton Craig, M.E.I.C., has been appointed chief superintendent of the Canadian Armament Research and Development Establishment, Valcartier, Que. Mr. Craig is on loan for two years from McGill University, where he is vice-principal of Dawson College and associate professor of civil engineering and applied mechanics.

Mr. Craig was educated at McGill University, taking his B.A. with first class honours in mathematics and physics in 1930, his B.Eng. with honours in 1933 and his M.Eng. in 1934, both in civil engineering. From 1934 to 1940 he was a lecturer in civil engineering and mathematics at McGill University. In 1940 he became chief ground instructor at the Windsor Mills Flying School, No. 4 E.F.T.S. under the Joint Air Training Plan. In 1941 he became technical assistant to the director general, Department of Munitions and Supply, Army Engineering Design Branch.

In 1945 Mr. Craig returned to McGill University as associate professor of civil engineering and assistant vice-principal of Sir William Dawson College. In 1947 he became vice-principal, which post he still holds.

F. H. Chapman, M.E.I.C., has resigned as executive secretary of the Association of Professional Engineers of British Columbia, to become assistant consulting metallurgist for the Anglo-American Corporation of South Africa. He was scheduled to sail July 15th from Montreal for N'Kana, Northern Rhodesia. Prior to joining the staff of the Association in Vancouver, he had been for years a member of the Trail staff of the Consolidated Mining and Smelting Co. of Canada, Ltd.

James T. Cawley, M.E.I.C., was runner up to the Rt. Hon. C. D. Howe. Hon.M.E.I.C., at Port Arthur, Ont., in the recent federal election. Mr. Cawley was contesting an election for the first time, as C.C.F. candidate. He is an instructor at Lakehead Technical Institute, Port Arthur.

F. J. Sauder, M.E.I.C., is with Canadian General Electric, Montreal, as a quality engineer. He was previously assistant works superintendent of Canadian Car & Foundry, Montreal.

Paul Guennette, M.E.I.C., has joined the Federal Department of Transport, Quebec Canals Division. He was previously plant engineer for Canada Flooring Co. Ltd.

G. L. G. Frank, M.E.I.C., has gone as an electrical engineer to the Polymer Corporation in Sarnia, Ont. He was previously with Bepco (Canada) Ltd., Montreal.

P. Andre Grathe, M.E.I.C., has joined the Department of Transport, Canals Division, Montreal. He has been with the Hydro-Electric Power Commission of Quebec in the engineering department in Montreal since his release in 1945 from the R.C.A.F.

G. E. Dowsan, Jr.E.I.C., is machine design draughtsman for Modern Tool Works in Toronto. He had been with Dowty Equipment (Canada) Ltd., Montreal, since his graduation in mechanical engineering in 1941 from the University of Saskatchewan.

J. Keith Gordon, Jr.E.I.C., who has been elected secretary of the Junior Section of the Ottawa Branch of the Institute, is manager of the Ottawa Office of Dominion Structural Steel Ltd., Ottawa. He is a civil engineering graduate of Queen's University, class of 1945.

F. G. Carrington, M.E.I.C., who graduated in engineering this year from University of Toronto, is employed as a design engineer in the construction engineering division of the Hydro-Electric Power Commission of Ontario, and is located in Toronto.

M. B. T. George, S.E.I.C., has been awarded the Curtiss-Wright Corporation fellowship in aeronautical engineering. He received the bachelor of engineering degree this year at McGill University. He will work toward the degree of master of aeronautical engineering at Cornell University, Ithica, N.Y.

K. R. Stehling, S.E.I.C., writes that he went in March to the American Optical Company in Buffalo, N.Y., as industrial physicist in the instrument development section. He is working on development of new optical instruments and improvement of existing ones for industrial application. He is also doing post-graduate work at the University of Buffalo.

William Rowe, S.E.I.C., is with the Ontario Hydro Electric Commission in Ottawa. He is a 1949 graduate from Queen's University in electrical engineering.

H. R. Mantgamery, S.E.I.C., is junior mechanical engineer with the National Research Council at Chalk River, Ontario. He is a 1949 graduate in mechanical engineering from the University of Saskatchewan.

C. W. Kerry, S.E.I.C., has joined the staff of Dominion Oilcloth Company in Montreal, after graduating this year in chemical engineering from McGill University.

G. M. Beaumont, S.E.I.C., has obtained a position with the engineering firm of Underwood and McLellan, in Saskatoon, Sask.

Visitors to Headquarters

George W. Graves, Orlando, Fla., July 6.

S. D. Levine, M.E.I.C., Buffalo, N.Y., July 12.

Edmond J. Gallant, S.E.I.C., Moncton, N.B., July 17.

Donald Brown, Newcastle-on-Tyne, England, July 19.

D. Callis, M.E.I.C., Kentville, N.S., July 19.

I. M. Fraser, M.E.I.C., Saskatoon, Sask., July 19.

Norman W. Llewellyn, Stockport, England, July 22.

Mrs. C. E. Sisson, Stouffville, Ont., July 22.

Otto Olsen, M.E.I.C., South Slocan, B.C., July 27.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Dr. Ernest Brown, Hon. M.E.I.C., died at his home in Montreal on June 24th, 1949, after having been ill for some time. He was professor emeritus of applied mechanics and former dean of the

Photo by Notman

Ernest Brown, Hon. M.E.I.C.

faculty of engineering at McGill University.

Dr .Brown was born in Lancashire, England, in 1878. After taking his early education and obtaining the degrees of master of science and master of engineering, he came to Canada in 1905. He was assistant professor of applied mechanics at McGill and was later appointed associate professor. In 1911 he was named professor of applied mechanics and hydraulics.

Keenly interested in practical engineering as well as in teaching he pioneered in the application of concrete to ship building and in the saving of metal in building design. He designed the "*S.S. Concretia*", the first all-concrete ship to be built in Canada, which was launched in 1917.

A widely recognized hydraulic power authority, he was engaged for many years by The Shawinigan Water and Power Company in testing models of water turbines so that the efficiency of Canada's electric power production might be increased.

In 1941 the University of Toronto awarded him an honorary doctorate in engineering, and in 1947 he was made an honorary member of the Engineering Institute of Canada.

From 1930 to 1942 he was dean of McGill's engineering faculty and in 1943, after his retirement he was appointed emeritus professor of mechanics and hydraulics.

Dr. Brown was active in the affairs of the Institute and represented the Montreal Branch on Council in 1918, 19, and 20. In 1909 and in 1915, he received the Gzowski Medal of the Institute. The papers for which these awards were made were notable contributions to the literature of the profession. They recorded valuable investigations in reinforced concrete design at a time when this form of construction was relatively new to Canada.

Upon his election to honorary membership in 1947, the citation read as follows:—

"The hydraulic resources of Canada are large. This industrial development is a matter of vital importance. Tonight we honour a man who has made outstanding contributions to this development and to the development of engineering knowledge covering a wide range of activities. His investigations in the field of reinforced concrete are notable. He had an important share in the difficult special studies carried out in connection with the design of the Quebec Bridge, and his experiments and researches on the strength of ice have added greatly to the engineer's knowledge of this troublesome substance in relation to his structures and machines. Of notable importance too, have been his studies, pursued over many years, on model turbine runners".

Dr. Brown's influence on engineering education has been profound. Members and heads of the engineering faculties of many of our universities have been his students and have carried to every part of Canada the ideas and inspiration gained from his teachings.

Maj.-Gen. H. M. Cawthra-Elliot, M.E.I.C., prominent in military service in Canada and overseas, died on June 27, 1949 at his home at Lakeview, Ont. He had been ill for the past year.

Prior to his retirement in 1925, Major-General Cawthra-Elliot was commissioner of the Ontario Provincial Police for one year and served as justice of the peace for three years.

Born at Bangalore, India, he received his early education in England and was graduated from the Royal Military Academy, Woolwich, Eng., with the rank of second lieutenant, R.A., in 1888.

As a soldier, Maj.-Gen. Cawthra-Elliot saw service in 1890-96 in Bermuda, the West Indies, Halifax and other stations. He served from 1900 to 1903 in the Boer War. Later he saw service in the Boxer Rebellion in China. Returning to England, he was posted as an instructor. In 1909 he was stationed in the South of Ireland in an administration capacity. Two years later he was appointed director of artillery, Military Headquarters, Ottawa, and in 1913 was transferred to Toronto as head of the administrative staff.

Maj.-Gen. Cawthra-Elliot's appointment in 1915 as camp commandant, Sewell, Man., coincided with his appointment as member of the Military Council of Canada with which he served until 1920.

During his career he had been awarded the titles of C.B. and C.M.G.

He was honorary president of the Port Credit Branch, Canadian Legion; and a member of the Canadian Military Institute. He joined the Engineering Institute in 1920 as a Member.

A. E. Pickering, M.E.I.C.

A. E. Pickering, M.E.I.C., who had retired in 1948 as president and general manager of the Great Lakes Power Co. Ltd., Sault Ste. Marie, Ont., died on April 21, 1949.

Mr. Pickering was born at Brampton, Ont., and he graduated in mechanical and electrical engineering from University of Toronto in 1904. From 1905 to 1912 he was assistant engineer and in 1912-1913 manager and engineer of the Lake Superior Power Company. From 1916 to 1932 he was manager and engineer and from 1932 vice-president and manager of the Great Lakes Power Company Ltd., at Sault Ste. Marie.

Mr. Pickering has been active in the Institute which he joined in 1921 as a Member. He represented the Sault Ste. Marie Branch on its Council in 1930-33, and again in 1942.

R. S. Logan, M.E.I.C., vice-president of Accessories Manufacturers Limited, Montreal, died in hospital on June 25, 1949, after a brief illness.

Mr. Logan was born at St. Albans, Vermont, in 1901. He attended Lower Canada College and McGill University, receiving from the latter in 1925 the degree of B.Sc. in mechanical engineering.

He worked in 1925 and 1926 as a representative on the extension of the mill of Dominion Textile Co. Ltd., at Montmorency Falls, Que., and he worked in 1926-28 for Fraser Brace Engineering Co. Ltd., on the construction of the International Paper Company's fibre board mill at Gatineau, Que. He was assistant superintendent of that mill for a year, and in 1929 he went to Canadian Industries Limited.

He did engineering work for C.I.L. at the Beloeil works, at the Windsor works, Sandwich, Ont., and at Shawinigan Falls, Que.

He joined Accessories Manufacturers Ltd., Montreal, in 1933 as an engineer. He was its vice-president at the time of his death.

Mr. Logan joined the Institute as a Student in 1922, transferring to Associate Member in 1933 and to Member in 1940.

Jacques Shooner, M.E.I.C., of Pierreville, Que., died at his home on July 7, 1949.

Mr. Shooner, who was born at Pierreville in 1914, studied at Ecole Polytechnique, Montreal, graduating in 1943 with the degree of B.A.Sc. in civil engineering.

He practised engineering in that locality, being for a time a technical advisor and draughtsman on fire pumps and accessories for Pierre Thibault. He later inaugurated the firm Shooner & Co., there. He had also operated a general store at Pierreville for some time before his death.

Mr. Shooner joined the Institute as a Student in 1943, transferring to Member in 1945.

SHARE YOUR STORY

(Continued from page 467)

his dreams. Yes, I was interested and humbled, but I did look for the feel of the future — gentlemen, engineers — you who have done so much. Excite us about the possibility of harnessing the tides — gentlemen, hook arms with the geologist and the physicist and tell us more about what we can do on the roof of the world. Educate—stimulate public opinion as to the possibility of cheating Jack Frost in the Great Lakes . . . turn your thoughts to the problem of why the Maritimes are not feeding themselves. Let your trained minds roll and intrigue us with the paradise you could build and have already started. If democracy is to stand the tests of tomorrow you must come out of your shell and show us your blueprints. Man in his social way, in his living, in his adjustments, is years behind you. You ride in the diesel — we ride in the caboose and some of us still in the ox-cart. Surely it is your responsibility to forget tradition and devise some way to lift us and hook us so that we ride with the engine and are not subject to the sways and lurches of the economic caboose.

Two women engineers stole your show. The American woman's credentials were on the public record . . . the Canadian woman's achievements were almost unknown. This is the most Canadian of diseases. At Quebec I found that your honourable Institute suffers from the same disease. You have not "Shared Your Story". You have been consultants, not leaders. At Quebec you were tourists, not explorers!

Of course you are sincere . . . of course you have placed some of the most dazzling pages in Canada's book. Look what you did in conversion to war — you have led the world in hydro electric production —you lead in many fields of mining and in newsprint manufacture. You can do more for us tomorrow than any other group in the country. That is my whole point . . . that society today is in such a mess that you can no longer be content with your posts at the draughting board. I hope you will emerge and at Quebec I did see some signs of your new march. Dr. J. N. Finlayson, your retiring president, in his annual address rather cautiously hinted at the new role of the engineer when he said, "I trust that it may not be considered irrelevant to suggest that the engineer by virtue of his training in the fields of production, transportation and distribution may be able to make a contribution towards the solution of economic and political problems." Gentlemen, masters of nature's gaps and inventors of industry — there are still the social canyons to be bridged. Engineers, why not "SHARE YOUR STORY".

NEWS of the BRANCHES

Activities of the Twenty-nine Branches of the Institute and abstracts of papers presented at their meetings

Lakehead

G. S. Halter, jr.e.i.c.
Secretary-Treasurer

A general meeting of the Lakehead Branch of the Engineering Institute of Canada was held at the Lakehead Technical Institute on Monday evening, April 25th. W. E. MacLennan, branch chairman, presided and there were 35 members present.

W. H. Small, the branch's councillor, reported on the meetings of Council and of the Ontario Division of the Institute in Hamilton on March 19th. He advised that with regard to the proposed Co-operative agreement between the Institute and the Association of Professional Engineers of Ontario, there was considerable caution shown by those present. It was pointed out at that meeting, Mr. Small said, that the membership of the Association is considerably greater than that of the Institute in Ontario, and some were of the opinion that any offer of co-operative agreement should come from the Association rather than from the Institute.

Mr. Norton introduced the guest speaker, M. N. Vuchnich, president of Lincoln Electric of Canada Limited, who outlined the development of the modern shielded arc electrode and stressed the advantages of welding over other methods of joining metals. He pointed out that a welded joint can be readily made stronger than the parent metals, which gives it an advantage over riveting. Mr. Vuchnich cited as examples of the present popularity of welding, the shipbuilding industry which is now using welding extensively, and the two new hospitals in Toronto, Sick Children's and Mount Sinai which would have all welded frameworks.

The Canadian Welding Bureau was formed, the speaker said, to protect the public by approving welders as being competent to do their jobs.

Mr. Vuchnich touched on the Lincoln Electric wage incentive plan. The workers' salary, in that plant last year averaged $5,500.00, and each man produced an average of $28,000 worth of goods. He said that the company increased production, not by having the men work harder but by cutting costs and using more efficient methods.

Two very interesting films were then shown: "Designing Machinery for Arc Welding" and "Prevention and Control of Distortion by Arc Welding."

Considerable discussion took place after the films were shown. Mr. Les Emery tendered a vote of thanks to the guest speaker. Mr. MacLennan also thanked Mr. Mort Brown who had acted as projectionist. The meeting adjourned and was followed by a light lunch.

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A general dinner meeting took place at the Port Arthur Country Club on Thursday evening, May 5th. There were fifty-seven members and guests present.

Mr. MacLennan, presiding at the meeting, said that it was a great pleasure and honour to have present the president of the Institute, Dean J. N Finlayson, and the assistant general secretary, W. D. Laird.

Mr. MacLennan introduced Mr. Laird, who brought news from Headquarters. He advised that a membership directory would be published in the near future. He remarked also that the facilities of the Institute library are not being used as much as they might be by members residing outside of Montreal and referred particularly to the fact that subscriptions to the journals of other professional societies can be obtained through the library at reduced rates.

J. M. Fleming, a former student of Dean Finlayson's, introduced the president of the Institute, who is dean of Engineering of the University of British Columbia. Dean Finlayson stated that it was a pleasure to be at the Lakehead and see his many friends again. He was pleased also with the large turnout of young men at the meeting.

In his travels across Canada visiting the various branches of the Institute, Dean Finlayson had found many projects of tremendous significance to engineers; for example, in Nova Scotia the bridge across the Strait of Canso; the huge iron ore and titanium deposits in Quebec yet to be mined; spectacular oil developments in Alberta; and great hydro-electric power sites now being investigated in British Columbia.

The President agreed that there should be a co-operative agreement between the Association of Professional Engineers of Ontario and the Engineering Institute. He had met in British Columbia with heads of many engineering organizations where there was feeling expressed that no one engineering organization has the power to speak for all engineers in the Dominion, as the legal, medical and dental societies do. There had been hope expressed that a body of this kind might be created in the very near future.

Dean Finlayson touched on the matter of the Institute conducting its own admission examinations for non-graduates. He said that the branches were fairly evenly divided as to opinions in the matter. There were varied opinions on the question of admitting without examination, arts and science graduates who were doing engineering work. Dean Finlayson remarked that many good engineers are not graduates.

Mr. Antonisson, an Institute member since 1906, and one of the oldest Lakehead Branch members, moved a very able vote of thanks to Dean Finlayson.

Mr. Halter then introduced Mr. James A. Vance, a vice-president of the Institute from Woodstock. Mr. Vance suggested investigating many areas where engineers are employed, with a view to establishing branches there. Extra office space at headquarters is urgently required at the present time, he said. Mr. Vance advised that consideration was being given to the setting up of a special fund to take care of this and other special matters that come up from time to time.

After a five minute recess an informal discussion took place regarding the Institute fees, and regarding the publishing of technical papers as supplements to *The Engineering Journal.*

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The annual dinner meeting of the Lakehead Branch was held Tuesday evening, June 21st in the Norman Room of the Royal Edward Hotel, with sixty people present.

W. E. MacLennan presided and welcomed the members and guests, and stated that he was gratified at the large turnout.

The chairmen of the various committees gave their reports. S. E. Flook, chairman of the Nominating Committee announced the election of officers for the coming year, as follows: chairman, H. M. Olsson; vice-chairman, O. J Koreen; secretary-treasurer, G. S. Halter; ex-officio, Councillor W. H. Small and W. E. MacLennan; executive, A. J Michelson, A. D. Norton and D. Hunter, C. L. Emery, H. A. Oaks, T. C. Anderson, D. R. Beckett, and A. H. Rabb.

Mr. MacLennan then introduced Dr. G. K. McKeown, president of the Thunder Bay Dental Society; Mr. M. W.

Babe, president of the Lakehead Law Society, and Dr. Winston Friday, secretary of the Lakehead Medical Society. Each spoke briefly and brought greetings from their respective societies.

Mr. McLennan handed over the chair to the incoming chairman, Mr. Harry M. Olsson. Mr. McLennan said that it had been a great pleasure and a great responsibility to be chairman for the past year, and that the Institute had had a successful year. He thanked the members of the executive for their co-operation. Mr. Olsson stated that he was proud to be the new chairman. He looked forward to a very active year. Mr Olsson advised that the E.I.C. president, Mr. J. Armstrong, of Montreal, would visit the Lakehead on October 19th.

A. D. Norton then called on Mr. J. Murie of the Canadian General Electric Company, who gave a short talk on **Television.** Mr. Murie stated that in Canada at the present time there were 12,000 television sets built or in service, whereas 500,000 new sets have been built in the U.S.A. in the last four months. According to the speaker, television is mainly a visual proposition since the screens are small and the picture must be nearly perfect so as to eliminate eye strain. Thirty miles is the maximum distance that television can be transmitted except on very level country. Television is transmitted, Mr Murie stated, from one relay station to another. It can be transmitted by coaxial cable which is very expensive though, costing about $5,000.00 per mile.

Two films were shown; one on television, "Sight Seeing at Home", and the other about Frequency Modulation, "Naturally its FM".

Montreal

Conscious of the necessity for increased Branch activities in order to satisfy the requirements of an ever-expanding membership, the executive committee has asked the programme committee to consider adding to the number of papers presented for the benefit of the membership.

It has now been arranged that, commencing January, 1950, two general Branch meetings will be held every week. Thursday night meetings will be held, as in the past, and papers presented then will be of general interest. In addition, meetings will be held on Tuesday nights and the papers will deal with specialized branches of engineering and be essentially technical in nature.

It is hoped that the new programme well help meet the needs of members who want to hear and discuss papers in their own technical fields and that the general papers will act as a bond between all groups. This new programme will place a heavy additional load on the programme committee who should be rewarded with large attendance at all meetings.

The opening meeting for the coming season is to be a dinner at the Mount Royal Hotel on September 29th, followed by an address by our president and fellow branch member, Mr. J. E. Armstrong. Tickets will be only $2.50 each, which should ensure a record turn-out for the event.

The general secretary has informed your Branch secretary-treasurer that, with regrets to the Branch, Council has withdrawn the use of the Reading Room for the membership. Increased work at Headquarters has made it necessary to convert the Reading Room into office space for the accounting and records departments. The library is still available and a quiet corner on the ground floor has been reserved for members who wish to refer to the many books and periodicals kept for their use.

Saguenay

T. T. Anderson, jr.e.i.c.
Secretary-Treasurer

Junior Section

W. A. Dayton, m.e.i.c.
Secretary-Treasurer

At a meeting of the Junior Section, of the Saguenay Branch, at the Saguenay Inn on Wednesday, June 1st, 1949, Robert H. Wood of the operating department of the Shipshaw power development spoke on **Meteorology and Weather Forecasting.**

Mr. Wood, a graduate of M.I.T. in civil engineering and in meteorology, described briefly the functions of the civil engineering and in meteorology, the basic principles of modern weather forecasting. Meteorology has two main divisions, theoretical and applied. The former is divided into dynamic meteorology, physical meteorology, and climatology; and the latter into aeronautical, industrial, and hydrometeorology. Modern weather theory is concerned mainly with the production and movement of various kinds of air masses superimposed upon the primary circulation of the atmosphere. Factors affecting the movements are heat from the sun, rotation of the earth and the earth's gravitational force. Long range forecasts have recently been developed to a fairly satisfactory degree of accuracy. They depend almost entirely upon measurements of the physical properties of the upper atmosphere. In recent years the techniques of hydrometeorology have been employed successfully in the design and operation of flood-control and power projects — they are used to forecast stream flow and water supply. Mr. Wood also discussed meteorological instruments and the part that they have played in the development of this science.

A discussion period followed the showing of two films, "Thunderstorms" and "Modern Weather Theory — Primary Circulation of the Atmosphere".

C. J. Tanner thanked the speaker on behalf of the Junior Section. Coffee and refreshments were enjoyed by the large crowd present.

Vancouver

Alan Fletcher, jr.e.i.c.
Secretary-Treasurer

Stuart A. Lefeaux, jr.e.i.c.
Branch News Editor

On Wednesday, June 15th members of the Vancouver Branch were favoured with an address on **Utilization of Wood Waste** by Mr. F. W. Guernsey, of the wood utilization division of the University of British Columbia Forest Products Laboratory. Mr. Guernsey is a forest engineer graduate of the University of British Columbia and well known for his research work and study on wood waste uses in British Columbia.

Mr. Guernsey prefaced his address with a few generalities on wood production. Canada is the world's largest exporter of wood products in the world and also the most wasteful. The production of wood is not sufficient to meet the demands of the world's users. The standard of living of a country may be estimated from the amount of wood used per person; North American consumption is approximately 244 lbs. per person per annum.

Logging waste is defined as "sound material left on the ground after logging operations". Sawmill waste is defined as "wood that is left over and cannot be converted to lumber" Approximately 2,700 cubic feet per acre, or 20 per cent is left as waste after high lead logging operations. Of this waste approximately 1,600 cubic feet per acre is salvageable for pulp manufacture but more research is necessary to make it economical.

There are more than 400 sawmills in operation in the B.C. coast region and the average sawmill waste is 22 cubic feet for every 1,000 board feet of logs cut. Sawmill waste products include: pulp chips, laths, broom handles, shingle bands, sawdust and fuel. British Columbia mills sell chips to the United States pulp mills as there are no pulp mills at present equipped to handle sawmill waste in British Columbia. "Presto" logs of sawdust and mill waste are now being manufactured in British Columbia. Wallboards, ethyl alcohol, yeast, molasses, domestic gas, coal tar and charcoal are all possible products of wood waste. The problem of sawmill operators is how to economically utilize wastes and market the products on a competitive basis; the high cost of machines and processing equipment are prohibitive for the small operators.

All members showed a keen interest in this most timely topic. Percy Bland thanked Mr. Guernsey for his address and for the splendid response to a barrage of questions.

Bill Kelly recently elected to the Institute Council, gave a few highlights of the Quebec convention. He was most impressed with papers on the aluminum bridge and high velocity missiles, and with other presentations, but he had little praise for television. His visits to "Muriel's Room" and baggage troubles kept him busy between sessions, he said.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

August 19th, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate *

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the September meeting.

L. AUSTIN WRIGHT, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

CLAIRE—JASWANT SINGH, of Amritsar, East Punjab, India. Born at Jallundur City (E. Punjab), March 4, 1913. Educ.: B.Sc., (Engrg.), The Punjab College of Engrg. and Technology, Lahore (Punjab Univ.), 1938; A.M., I.M.E.; Gov't. of Punjab, as follows: July 1939-Dec. 1940, sub. divn. officer, mtce. and repairs to irr. canals and their control works, such as gates, outlets, escape work, etc.(Punjab has one of largest irr. systems in world) have held responsible charge of the irri. system, responsible for entire running and mtce. of a sub-divn., Jan. 1941-Nov. 1942, asst. engr., Gov't. Central Workshops, Amritsar, entirely responsible for purchase, custody and issue of all engrg. stores; for Gov't. of India, as follows: Dec. 1942-Sept. 1946, asst. works mgr., Indian Ordnance Factories, degree of responsibility can be gauged from fact that during last war this facty. produced about 1¼ million 25-pdr. Q.F. shells with the Canadian Hepburn Plant, 1500 invasion pontoon, etc.; Gov't. of Punjab, Sept. 1946-1947, executive engr. i/c. Hussainewala Workshops, repairs and reconditioning of internal comb. engines, elect. motors and generators, etc.; 1947 to date, works mgr., Gov't. Central Workshops, Amritsar, responsible for design and mfg. of gates, lifting gear, manual and elect. control for the 80 ft. Nangel Dam—project to provide irri. facilities for 5 million acres of land—Gov't. of India are mfg. 1,000 steam road rollers to design and specification of Marshall & Co., England. responsible for design and mfg. of tools, jigs, fixtures and gauges for components being mfg. in this factory, etc

References: S. B. S Singh, (M., I.S.E.), C. L. Handa, (A.S.C.E.), W. G. Wheatley, (M., I.M.E.), S. G. Barrass, (A.M., I.M.E.), S. S. Kumar, (A.M., I.E.E.)

COOK—ROBERT EDWARD, of Shawinigan Falls, Que. Born at Calgary, Alta., June 23, 1924. Educ.: B.Sc., (Chem. Engrg.), Alberta, 1949; with Canadian Industries Ltd., as follows: 1948, special training course, Windsor. Ont., 1948 to date, jr. engr., develop't section, alkali divn., Shawinigan Falls, Que.

References: C.C. Cuthbertson, R. W. Fugler, M. Eaton, H. K. Wyman.

DUFOUR—LEON MARCEL, of Montreal, Que. Born at Lyon, France, Jan. 31, 1889. Educ.: Engineer, National School "Arts et Metiers," Cluny, France, 1909, Member, Society Civil Engineers of France; 1912-14, designer, Mouchel & Partners, civil engrs., London, Eng.; 1914-17, Lieut., Military Engrs., French Army; 1917-18, Lieut., Liaison Officer, American Army, Camp Logan (Houston, Texas); 1918-1919, 4th Army Corps, France; 1919-21, engr., Societe d'Etudes et de constructions en beton arme (reinforced concrete), Paris; with Societe des Grands Travaux de Marseille, as follows: 1936-39, chief engr., i c of projects and designs; 1939-40, Capt. C/O Coy of Signals, 15th Army Corps (French Army); with Societe des Grands Travaux de Marseille, as chief engr i/c of reconstruction contracts on the following bridges: 1941-44, Valence, France, 1942-46, Briord, 1946-49, Evieu, 1943-46, Lyon, 1946-49, reconstruction Quai Wilson Nantes, 1947-49, constrn. steam power station, St. Etienne; at present, managing-director, A. Janin & Co. Limited, Montreal, Que.

References: F. W. Taylor-Bailey, R. S. Eadie, J. E. Bertrand A. Cousineau, R. J Kane.

FINLAYSON—JAMES COLIN, of Ottawa, Ont. Born at Tignish, P.E.I., Oct. 12, 1918. Educ.: B.A.Sc., (Mech.), Toronto, 1940, R.P.E., Ontario; 1940, (4 mos.), jr. indus. engr., Proctor & Gamble of Canada; 1940-41, asst. to factory supt., Dominion Am. Divn., C.I.L., Brownsburg, Que.; 1942-45, research engr., (aero), aircraft performance, testing and compilation of reports, R.C.A.F. Test & Develop't. Establishment, Rockcliffe, Ont.; 1945-46, jr. engr., routine design work, aerodynamics section, Turbo Research Ltd., Leaside, Ont. 1946-47, engr. i/c full scale test plant, responsible for operation of plant admin., supervn. of constrn. and mtce. of test facilities, A. V. Roe Canada, Ltd., Nobel, Ont.; 1947 to date, research aero engr., assisting chief res. aero engr. in conduct of studies and researches on wide variety of problems concerned with various aspects of civil aviation and preparing reports thereon, etc., Air Transport Board, Dominion Government, Ottawa, Ont.

References: J. J. Green, A. Ferrier, T. R. Loudon, H. S. Rees, P. R. Woodfield, P. B. Dilworth.

HERBICH—JANUSZ BRONISLAW, of Edinburgh, Scotland. Born at Warsaw, Poland, January 9, 1922. Educ.: B.Sc., (Civil Engrg.), Univ. of Edinburgh, 1949; Student, I.C.E., London; 1944-45, (8 mos.), surveying, Officers course, R.E.; 1946, (summer), lab. asst., soil mechanics lab., City & Guilds College, London; 1948, (3 mos.), asst. site engr., John Laing & Son, London, England; 1949, (July and August), experiments on small scale models, Waterloopkundig Laboratorium, Hydraulic Research Institute, Delft, Holland.

References: R. N. Arnold, (M., I.M.E.), D. S. Stewart, (M., I.C.E.), J. B. Todd, (M., I.M.E.), H. P. Herbich, (A.M., I.C.E.) C. Patterson, (M., I.M.E.), W. Dudgeon, (A.M., I.C.E.)

HORNBY—FRANK, of Baie Comeau, Que. Born at Bolton, Lancs, Eng., Oct. 18, 1914. Educ.: B.Sc., (Eng.), Manchester Univ., 1937; A.M., I.E.E.; with Metropolitan Vickers, as follows: 1933-38, college apprent., 1938-41, jr. erection engr., supervising erection of elect. industrial plant; 1941-46, elect. mtce. engr., Imperial Chemical Industries Ltd.; 1946-49, elect. engr., i/c all elect. work at Co.'s London brewery, A. Guinness Son & Co., Ltd.; at present asst. elect. supt., Quebec North Shore Paper Co., Baie Comeau, Que.

References: M. H. Jones, C. Miller, S. J. Simons, J. F. McInnis, J. M. Pope.

JOHNSON—JOHN SIGUR, of Vancouver, B.C. Born at Winnipeg, Man., Dec. 29, 1901. Educ.: B.Sc., (Civil), Manitoba, 1924; estimator and supt. for the following Chicago companies: 1925-33, Simpson Construction Co.; 1933-38, Aldrich Construction Co.; 1938-40, Orfei Construction Co.; 1940-46, Herlihy Mid-Continent Co.; 1946-48, Abbott Contractors Inc.; at present general contractor, Vancouver, B.C.

References: J. N. Finlayson, J. F. Muir, J. A. Walker, C. A Colpitts, R. C. Pybus.

JOHNSTON—IAN LESLIE, of Montreal, Que. Born at East London, South Africa, Aug. 19, 1924. Educ.: B.Sc., (Engrg.), Univ. of Cape Town, S.A., 1945; with Univ. of Cape Town, S.A., as follows: 1946, staff assistant, Dept. of Civil Engrg., supervision of lab., tutorial and field survey classes—during this period engrg. asst., employed to assist in preparation of a report on proposed outdoor hydraulics lab. for the Engrg. Faculty, the work included selection of a suitable site, preliminary design, etc., etc.; May, 1947 to March, 1948, asst. engr., genl. municipal engrg., on develop't. of new townships, survey, setting out and constrn. of roads, drainage works, sewerage, etc., Epping Garden Village, Citizens Housing League Utility Co., Cape Town, S.A.; at present, transmission line design, Shawinigan Engineering Co., Ltd., Montreal, Que.

References: W. Sharples, G. Rinfret, J. A. McCrory, R. E. Heartz, A. L. Patterson.

KEATING—JOHN HUGH, of Ottawa, Ont. Born at Montreal, Que., March 13, 1925. Educ.: B.A.Sc (Civil). Toronto, 1949; 1944-45, Sergeant, R.C.E.; June 1947—Sept. 1947, instru'man., hydraulic dept., H.E.P.C. of Ontario; 1948, enrg., supvr. on small jobs, Dibblee Construction Co., Ottawa, Ont.; at present engineer, grade I, working on structl. design of projects under direction, Department of Reconstruction & Supply, Public Projects Branch, Ottawa, Ont.

References: V. S. Thompson, H. G. Cochrane, P. W. Walters, L. M. Christmas, G. Ridout-Evans.

KRUPSKI—ZBIGNIEW HENRY, of Montreal, Que. Born at Pressbaum, Austria, Sept. 1, 1910. Educ.: Diplom-Ingenieur (Elect. Engrg.), Technical Univ. of Vienna, 1935; A.M., I.E.E.; 1935-36, apprent'ships., motor car factory, Amstro-Fiat, Vienna; Brux Tramway & Bus Co., Brux; Teplice Tramway & Bus Co., Teplice, Czechoslovakia; 1936-38, workshop mgr., responsible for all repairs on motors and cars, etc., Bielsko Electrical and Tramway Co., Bielsko, Poland; 1938-39, chief elect. engr., Gov't. Aircraft Factory, Lublin, Poland; with R.A.F., as follows:—1942-44, Radar Officer i/c Nightfighter Squadron, 1944; Wing Signals Officer (F/L), 1944-46, Staff Signals Officer (Squadron Leader) at HDQS 2nd T.A.F. and B.A.F.O.; since June 1948 to date, chief engineer's dept., transmission division, transmission problems on radio circuits, etc., Bell Telephone Co. of Canada, Montreal, Que.

References: A. D. Nickerson, P. M. MacCallum, G. F. Inglis, W. A. Duckett, G. H. Krupski.

PEARCE—STUART EDGAR, of Peterborough, Ont. Born at Ottawa. Ont., April 25, 1924. Educ.: B.Sc. (Elect.), Queen's, 1948; R.P.E., Ontario; 1946 (summer), engrg. asst., Bell Telephone Co. of Canada; 1947 (summer), engrg. asst. Aluminum Co. of Canada; Canadian General Electric Co., Peterborough, Ont. 1948, testman 1949 to date, industrial control engr.

References: G. R. Langley, D. R. McGregor, W. T. Fanjoy, J. C. Allan, A. R. Hailey, A. L. Malby, D. M. Jemmett.

PURDY—ALEXANDER WILLIAM, of Toronto, Ont. Born at Toronto Ont., Feb. 2, 1924. Educ.: B.Sc. (Civil), Queen's, 1949; 1947 & 1948 (summers), dftsman., Dominion Bridge Co., Ltd.; at present, engineer, dept. of sales, Canada Cement Co., Ltd., Toronto, Ont.

References: J. M. Breen, D. O. Robinson, R. A. Crysler, H. S. Irwin.

SCHWENGER—WILLIAM CHARLES, of Hamilton, Ont. Born at Hamilton, Ont., March 11, 1917. Educ.: B.A.Sc. (Mining), Toronto, 1940; R.P.E., Ontario; 1940-42, field engr., Electro-Metallurgical Co., Ltd., Welland, Ont.; 1942-43, construc. supt., Canadian Kellogg Co., Sarnia, Ont.; 1944-47, project engr., Piggott Construction Co., Ltd., Hamilton; at present, president & genl mgr., engaged on general contracting—sewage plants, bridges, hospital. constrn., etc., Hamilton, Ont.

References: A. A. Moline, C. C. Parker, W. J. W. Reid, W. D. Brownlee, N. K. Cameron.

VINER—WILLIAM CHARLES, of Montreal, Que. Born at Montreal, Nov 22, 1918. Educ.: B.Eng. (Mech.), McGill, 1941; R.P.E., Quebec; 1941-42, jr. engr., Federal Aircraft; 1942-43, Engr. Officer, R.A.F., 1943-46, R.C.E.M.E.; 1946-47, pro. engr., E. A. Robinson Oil Burners Ltd.; 1947 to date, genl. mgr., M. Bernard & Son (Canada) Limited, Montreal, Que.

References: G. J. Dodds, T. A. Harvie, D. L. Lindsay.

TRANSFER FROM THE CLASS OF JUNIOR

ROWBOTHAM—BRIAN HOWARD, of Montreal. Born at Stranraer. Sask., on Aug. 5, 1919. Educ.: B.Sc. (Mech.), Sask., 1945; 1942, Aircraft Repair Ltd.; 1943, surveyor, J. G. Turnbull & Associates, Engineers, St. Louis, Mo.; 1945, sales & service eng. Benix Eclipse Ltd., Windsor; 1945-46, methods & design engr., Canadian Bridge Ltd., Walkerville; 1946-48, design estimating engr., Dominion Engrg. Works Ltd.; at present, production engr. L'Air Liquide Society Ltd., Mtl. (St. 1944. Jr. 1947).

References: N. B. Hutcheon, I. M. Fraser, G. H. Griffiths, J. T. Hugill.

SIDDALL—JAMES NORMAN, of Watertown. Mass. Born at Wainwright, Alta., on Oct. 27, 1921. Educ.: B.Sc. (Mech.), Sask., 1944; S.M (Mech.), M.I.T., 1948; summers 1941, rodman, airport surveys. Dept. of Transport; 1942, gauge inspector, Ogden Shops. Cdn. Pacific Railway, Calgary; 1943, dftsman, Cdn. Ingersoll-Rand, Sherbrooke, Que.; 1944-47, jr. research engr. structures laboratory, engaged in design, stress, analysis, testing of experimental structures, National Research Council, Ottawa; 1948-49, research staff member. Aero-Elastic & Structures Research Laboratory, Dept. of Aeronautical Engrg., M.I.T. Cambridge, Mass. (St. 1943 Jr 1946).

References: R. A. Spencer, I. M. Fraser, N. B. Hutcheon, J. H. Parkin, R. D Hiscocks.

FOR TRANSFER FROM THE CLASS OF STUDENT

DONALD—JOHN WILLIAM ALEXANDER, of Galt, Ont. Born at Saskatoon on Feb 24, 1916. Educ.: B.Sc. (Mech.), Sask., 1948; 1941-45, Sound Ranging Battery, 1st Survey Regiment, Royal Canadian Artillery: with city engrs., Dept. of Sask., 1946 (7 mos.). dftsman; 1947, instru'man: at present, jr. engr. checking drawings, preparation of bills of material for Detroit Stoker Dept., repair orders for company products. Babcock-Wilcox Goldie McCulloch Co. (St. 1948).

References: R. A. Spencer, I.M. Fraser, N. B. Hutcheon, E. A. Hardy, H. M. Weir

PALMER—EDWARD HENRY PETER, of Montreal. Born at Montreal on Jan. 7, 1923. Educ.: B. Eng. (Mech.), McGill, 1948; R.P.E., Que.; 1941, material expeditor, Canadian Marconi Co.; Sept. 1941-Sept. 1942, machinist & tool inspector, Harrington Tool & Die Co. Ltd., Lachine; 1943-44, production control & supervisor, Cambridge Machine Tool & Aircraft Supplies; summer 1945, machinist Canadair Ltd.; 1946-47, research asst. C.N.R.; 1948 to date, sales & contract engr. on fire protection with Walter Kidde & Co. of Canada Ltd. also water conditioning with Permutit Co. of Canada Ltd. (St. 1948).

References: C. A. Robb, C. K. McLeod, J. H. Ingham, D. Mordell.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged by *appointment*.

Situations Vacant

CIVIL

CIVIL ENGINEER, recent graduate, required for general field duties by Montreal firm. Location near Montreal. Salary open. Apply to File No. 1228-V.

CHEMICAL

CHEMICAL ENGINEER, age 30 years, required by a pulp and paper company in the St. Maurice Valley. Preferably with some experience in a process industry with preference for kraft pulp manufacturing. Excellent opportunity. Salary open. Apply to File No. 1222-V

ELECTRICAL

ELECTRICAL ENGINEER, required with about eight years experience in charge of electrical maintenance and construction crews. This position is an opportunity for advancement. Location Ontario. Salary depends on experience. Apply to File No. 1221-V.

ELECTRICAL ENGINEERS, required for the frequency conversion division of a public utility in Ontario. Salary open. Apply to File No. 1235-V.

ELECTRICAL ENGINEER, with a few years experience required by a steel company in Montreal for maintenance work and design. Salary open. Apply to File No. 1236-V.

MECHANICAL

MECHANICAL ENGINEER, required by Canadian University to teach machine design and allied subjects as of the first of October 1949. Salary open. Apply to File No. 1010-V.

MISCELLANEOUS

MECHANICAL, CHEMICAL, ELECTRONIC AND ELECTRICAL ENGINEERS ALSO GRADUATES IN ENGINEERING PHYSICS, required for armament research and development by a government establishment. Salaries open. Apply to File No. 1214-V.

GENERAL OPERATING SUPERINTENDENT, required by Maritime Public Utility. Applicant must be thoroughly experienced in operation and maintenance of overhead electric distribution system. Salary open. Apply to File No. 1215-V.

GRADUATE ENGINEER, preferably with training in engineering physics, or civil engineer, for several years work in the United Kingdom on defence problems. Applicant must have some knowledge of building construction. Age range 25-35 years. Salary open. Apply to File No. 1216-V.

HYDRAULIC ENGINEER AND ASSISTANT HYDRAULIC ENGINEER, required for Water Rights Branch, Department Lands, B.C. Civil Service. At least five years experience in positions of professional responsibility. British subjects under 45 years of age. Ex-service personnel given preference. Apply to File No. 1217-V.

SALES ENGINEER, age 30 to 40 years, required in Ontario for sale of anti-friction bearings. Experience in this field preferred. Salary open. Apply to File No. 1219-V.

SALES ENGINEER, required by manufacturer and exporters of forest products to promote the use and knowledge of their products to engineers, architects, contracting and purchasing agents of large industrials. Must be bilingual. Salary open. Apply to File No. 1220-V.

GRADUATE ENGINEER, required by Newfoundland Government with experience in road construction by contract. Salary open. Apply to File 1223-V.

GRADUATE ENGINEER, with draughting and design experience on reinforced concrete, structural steel and conveying equipment. Field construction experience valuable but not absolutely necessary. Location Montreal. Salary open. Apply to File No. 1224-V.

GRADUATE ENGINEER, required for post of Superintendent of Calgary Transit System. The system is being converted from street car to trolley coach and motor bus operation. Applicants to furnish full particulars of experience and qualifications. Salary open. Apply to File No. 1226-V.

ENGINEER, required by Department of Mines and Resources, Ottawa, as Forest Products Engineer. Salary $4,440 to $5,040. Apply to File No. 1227-V.

ARE YOU A KEEN TYPE? Can you discuss technical problems at a high level? Have you a car with which you could cover the province of Quebec to sell air filtration and silencing equipment for a British manufacturer who believes that the prospects are unlimited for the right man. It will be better if you are bilingual and thoroughly familiar with all types of prime movers and power equipment. If you believe you can meet exacting standards send complete details to File No. 1229-V.

SALES ENGINEER, with some interest in mechanical design work required in Montreal. Mechanical design would consume small portion of applicants time, sales would be on industrial blower equipment and polythene plastic tubing. Salary open. Apply to File No. 1230-V.

CIVIL OR MECHANICAL ENGINEER, required for position of assistant shop superintendent in large structural steel fabricating plant in Montreal. Salary open. Apply to File No. 1231-V.

MECHANICAL AND CHEMICAL ENGINEERS, required by Montreal firm manufacturing roofing products, etc., for training period. Salary open. Apply to File No. 1233-V.

GRADUATE CHEMICAL OR CERAMIC ENGINEER, required as Quality Control Supervisor. Preferably with several years experience in a glass plant with special emphasis on methods of analysis and theory of glass formation. Some knowledge of plastics desirable but not essential. Location Ontario. Salary open. Apply to File No. 1234-V.

GRADUATE ENGINEERS, with considerable experience on generating and sub-station planning and design. Required by public utility in Ontario for co-ordinating and planning several projects. Salary open. Apply to File No. 1235-V.

GRADUATE ENGINEER, with experience mostly in telephone planning, both inside and out, including repeater carrier and telephone equipment application, also some radio experience required by public utility in Ontario. Salary open. Apply to File No. 1235-V.

SALES ENGINEERS, one fluently bilingual, required for west end Montreal steel fabricating company for estimating and sales work. Permanent position with excellent prospects for advancement. Salary open. Apply to File No. 1238-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CIVIL

CIVIL ENGINEERS required by large organization with headquarters in Toronto. To take charge of design and construction of small timber and concrete dams and maintenance and operation of locks and dams, etc., throughout the Province of Ontario. Applicant must have at least several years experience on construction of timber and concrete dams with sluiceways, etc. Salary can be arranged to meet qualifications. Apply to File No. 1187-V.

CIVIL ENGINEER eligible for registration in B.C., with post-graduate training in Public Health; preferably with experience in municipal or public health engineering. Candidates must be British subjects under age of 45 except ex-service personnel, who are given preference. Salary $3,504, rising to $4,104 per annum. Apply to File No. 1206-V.

CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No 1210-V.

ELECTRICAL

ELECTRICAL ENGINEERS with at least five years practical experience in layout and erection high tension and low tension overhead lines on wood poles. Experience in transformer maintenance and repair, sub station switchgear maintenance and erection, would be an advantage. Required by Bahamas Government Electrical Department, Nassau. Salary open. Aply to File No. 1180-V.

ELECTRONIC ENGINEERS 23 to 35 years of age required for design and development of radar type electronic equipment and mechanical design. Previous experience on similar type of work desirable. Location Nova Scotia. Salary $3,000 to $5,000, depending on qualifications. Apply to File No. 1189-V.

ENGINEER, electronics field, with considerable experience on inspection methods and organization. Salary $3,480 to $4,080 depending on qualifications. Position in Ottawa. Apply to File No. 1204-V.

MECHANICAL

MECHANICAL ENGINEERS with at least five years practical experience in the operation and maintenance of four cycle diesel alternators in sizes up to 2,500 H.P. Required by Bahamas Government Electrical Department, Nassau. Salary open. Apply to File No. 1180-V.

MECHANICAL ENGINEER required for design, estimating and sales of various mechanical equipment, such as, internal combustion engine-driven generator sets, water purification and pumping plants industrial and contractors equipment. Position located in Ontario. Salary open. Apply to File No. 1192-V.

MECHANICAL ENGINEER, experience in product design and production methods, must be familiar with all engineering problems relative to manufacturing of metal products. Age 35-45 for manufacturing plant located near Montreal. Salary open. Apply to File No. 1198-V.

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicants should state age, experience and salary expected. Apply to File No. 1210-V.

MISCELLANEOUS

ASSISTANT ENGINEER for Provincial Government-West Coast. Duties include taking charge of maintenance and construction work on forest or park road projects, designing simple bridges and other structures, making reports and recommendation on allied engineering problems in connection with Forest Service projects. Must have several years practical experience. Salary $3,504, rising to $4,104 per annum. Apply to File No. 1181-V.

GRADUATE ENGINEER with technical and practical experience in concrete field required by large transit mixed concrete business in Montreal. Work would be under supervision of consulting engineer and applicant would be required to work as a liason officer between company to its consumers. Salary open. Apply to File No. 1182-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges, required by a steel company in Southern Ontario. Salary open. Apply to File No. 1184-V.

CIVIL OR AGRICULTURAL ENGINEER required in Farm Structures Division of an agricultural college in Ontario. Applicant would be in charge of teaching to the degree students in the fourth year course also two year Associate Farm course as well as research and demonstrations related to this field of work. Salary open. Apply to File No. 1195-V.

SALES ENGINEER with knowledge of chemistry desirable wanted by Canadian branch of American firm for industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate engineer and Canadian citizen. Location Ont. Age between 30 and 40. Salary open. Apply to File No. 1196-V.

JUNIOR SALES ENGINEER wanted by Canadian branch of American firm for industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate engineer and Canadian citizen. Salary open. Location Ontario. Apply to File No. 1197-V.

CONSTRUCTION SUPERINTENDENT, capable of supervising housing project. Must be familiar with all phases of prefabrication. State previous experience. Salary open. Apply to File No. 1199-V.

CONSTRUCTION ENGINEER, for Housing Development. Must be experienced at layout and have knowledge of prefabrication. Salary open. Apply to File No. 1199-V.

GRADUATE ENGINEER preferably mechanical or chemical required for sales engineering in the Toronto area. Should have some experience in sales and maintenance engineering. Salary open. Apply to File No. 1203-V.

ENGINEER, not over thirty-five years of age required by Canadian owned public utility operating in Bolivia. Must have at least 6 years experience in this field. Salary open. Apply to File No. 1205-V.

SALES ENGINEER required as Eastern Canadian Representative for an American firm. Applicant should be around 35 years of age, preferably with a mechanical engineering degree. A few years experience in selling industrial rubber goods would be an advantage. Territory Port Arthur to the Coast. Salary open. Apply to File No. 1207-V.

SALES ENGINEERS required by large chemical manufacturer. Applicants should have a chemical background and some sales experience. These positions offer a wide scope in products sold, fields covered and opportunity of advancement. Location Montreal and southern Ontario. Salary open. Apply to File No. 1211-V.

GRADUATE ENGINEER with experience in the manufacture of large industrial metal doors and in general sheet metal work required in Toronto to set up small plant. Salary open. Apply to File No. 1212-V.

ASSISTANT CHIEF ENGINEER required for Public Utilities Commission, Victoria, B.C. Candidates must be registered Professional Engineers in B.C. with at least ten years experience as a civil engineer or in an allied field, preferably in construction and operation of electric utilities and experience in public utility rate-making. Salary $4,884, rising to $5,484 per annum. Apply to File No. 1213-V.

Situations Wanted

CHEMICAL ENGINEER, McGill, M.E.I.C., C.P.E.Q., married, age 36, perfectly bilingual, seeks position with possibilities for active and personal interest with established manufacturing, contracting or consulting firm in executive or professional position. Preferably in Montreal or vicinity. Nine years continued service with present employers. Presently as Plant and Projects Engineer. Wide trade connections, engineering and administrative experience on operation project studies and all stages of realization: layout, equipment specifications and design field administration, procurements on wartime and recent projects. Apply to File No. 6-W.

RECENT GRADUATE, B.Sc. (Hons.) University of London, '49, Stud. I.C.E. Articled Municipal Engineer (England). Experience in drainage schemes, roads, swimming baths and supervision of works. Age 28, married, veteran 1939/46. Desires any work in Civil Engineering. Available for interviews South Ontario or East Quebec. Apply to File No. 24-W.

GRADUATE CIVIL ENGINEER, University of London, B.Sc. (Eng.), (Hons.) Stud. I.C.E. London, age 27, veteran. Two and half years experience in general water engineering, area supply and distribution desires a position giving interesting work in civil engineering. One year spent in Canada during war training with R.A.F. Apply to File No. 30-W.

REG. PROF. ENG. in Province of Ontario and Quebec, M.E.I.C., fully employed desires part time consulting and design work in field of factory modernization including conveyorization, ventilation, heating, compressed air, production methods, jig and fixture design. Has various experience in mechanical, aeronautical and furniture fields. Apply to File No. 140-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., age 43, desires spare time work. Twenty-one years experience in construction, both field and office, also plant maintenance covering design, supervision and surveying. Would like design or draughting work in evenings with surveying on week-ends Apply to File No. 225-W.

CIVIL AND ELECTRICAL ENGINEERING GRADUATE, M.E.I.C. with past experience covering engineering and building construction and maintenance, shop operation, heavy construction machinery sales and service. Past several years in managerial capacity. Seeks suitable change with greater responsibility in engineering or business. Apply to File No. 1266-W.

CHEMICAL ENGINEERING GRADUATE M.E.I.C., McGill, 1938, age 35. My experience has included laboratory work, production, chemical plant operation and costing, industrial development surveys, raw material supply planning, purchasing materials for plant construction and operating. Apply to File No. 1947-W.

MISTER EXECUTIVE does your enterprise require an intelligent, cooperative, and widely experienced young engineer for the broader aspects of planning and running a business? A note to the file below will put you in touch with a 37 year old married McGill graduate engineer M.E.I.C. He has spent 6 years in industry, 4 years in R.C.A.F. aeronautical engineering, and over 4 years in business consulting involving scientific management, industrial relations, sales, organization, etc. Present salary is over $6,000.00. An interview will convince you. Apply to File No. 2228-W.

CIVIL ENGINEER, M.E.I.C., Prof. Eng. (Ont.) Queens B.Sc. Mechanical background. 3 years general plant and machine shop experience. 6 months railway maintenance. 8 months railway and general construction. 8 months R.C.E. 17 months design engineer of pulp and paper mill also in charge of construction and plant layout. Presently employed as assistant chief engineer in Woodlands Division of eastern pulp and paper mill with full responsibility of all road, bridge and building construction. Available 1 month's notice. Location immaterial. Apply to File No. 2553-W.

CIVIL AND MECHANICAL ENGINEER, Jr.E.I.C. Age 28, married. Experience in construction and industry in surveying, structural design, construction supervision, motion study, production cost control, vibration control, clay processing, maintenance supervision, pulverizers and dust collectors, boiler installations, etc. Available on short notice for new assignments anywhere. Apply to File No. 2746-W.

MECHANICAL ENGINEER, Jr.E.I.C., University of Saskatchewan, 1944. Age 27, married. Experienced in supervision of maintenance and construction in the paper industry and the textile industry. Desires position with responsibility and opportunity for advancement. Apply to File No. 2928-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc., Queens, age 32, married, veteran, navy engineer officer, experience primarily includes heating and power plant design, estimating, construction, and maintenance. At present employed but desires change to responsible position in Ontario, British Columbia or Alberta. Apply to File No. 3020-W.

GRADUATE ENGINEER, M.E.I.C., P.Eng., B.A.Sc., Toronto, married, age 31. Desires employment as assistant to construction or municipal engineer or would consider position on engineering staff of manufacturing company. 4 years army engineering officer, 4½ years experience in construction, surveying, layout and mining. Presently located in Toronto. Apply to File No. 3077-W.

MECHANICAL ENGINEER, Jr.E.I.C., Jr. A.S.M.E., P.Eng. (Ont.), B.Sc., Queens, '47, married. At present completing work at Yale University towards master of engineering degree. Broad basic experience. Desires appropriate position, preferably in design. Available immediately. Apply to File No. 3111-W.

ELECTRICAL ENGINEER, Mar. '44. Jr. E.I.C. Technical Officer in Army 2½ years. Industrial experience 2 years. Courses completed in Business Administration. Desires position as Executive Assistant. or in Management Research field. Apply to File No. 3181-W.

GRADUATE U.N.B., 1949, in Electrical Engineering, anxious to secure a position in Ontario or Eastern Canada. Three years experience as a wireless electrical mechanic in the R.C.A.F. and one summer as an installer of dial phone equipment, also one summer with a power and paper company. Have also a complete commercial diploma. Position desired preferably with a Power Company or an auxiliary of such. Apply to File No. 3196-W.

CHEMICAL ENGINEER, S.E.I.C., B.Sc. '44, M.Sc. '45, Queen's, Ph.D. from Cornell University, Ithaca, N.Y., expected this summer, desires position in research or development in the chemical industry. Age 27, married. Good background in physical and inorganic chemistry, 1½ years experience in research and development department of abrasive company working on process and product improvement. Available September 1st. Apply to File No. 3197-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Ontario, University of Manitoba, '41. 32 years of age, single. Experience in construction airport buildings and sewer and water, 1½ years in aircraft inspection and instructor of inspectors, surveying for water power sites, 2 years in design of reinforced concrete and steel structures. Desire position with consulting engineer, in industry, or in municipal field. Available on short notice. Apply to File No. 3198-W.

PROFESSIONAL ENGINEER, Jr.E.I.C., B.Sc. Eng. Age 34 years, with 10 years engineering experience in plant operation, maintenance, design, construction and buying in the mining, rubber and petroleum refinery fields. 5 years previous diversified experience. Wishes to join the Purchasing Department of a reliable firm which is considering the employment of engineers in that department. Apply to File No. 3199-W.

MECHANICAL GRADUATE, age 24, Jr. E.I.C., P. Eng., Q., Queen's, 1947. Two years experience as a Maintenance Engineer with large Montreal industrial firm. Engaged in general plant and machinery maintenance work, including co-ordination of the work of draftsmen, machinists and other trades. Evening student in Commerce Courses. Navy veteran. Desires same type of work with another large or small Montreal industrial firm. Apply to File No. 3208-W.

GRADUATE ELECTRICAL ENGINEER, S.E.I.C., U.N.B., '49, age 22, single. Experience limited to three summers in both preliminary and construction surveys for Highways, and one with Canal Service. Interested in Power Installation and development. Would consider employment abroad. Apply to File No. 3209-W.

MECHANICAL GRADUATE, Grad. I.M.E., Cambridge University, single, age 26. 3 years shop apprentice in English plants, 3 years Engineer Office Royal Navy, running and maintenance of steam turbine and reciprocating machinery. Now special apprentice machinist in U.S. Desires junior production position in Ontario. Apply to File No. 3210-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., Toronto. Veteran, age 27. Primarily interested in structural steel or reinforced concrete design but will consider anything. Available immediately. Apply to File No. 3211-W.

CIVIL ENGINEER, Student Member I.C.E., B.Sc. (Hons.), (London), ex-R.E.M.E. Captain, fluent French, Spanish, German, experience England, Switzerland, Spain, France, Egypt. At present working in Paris, seeks post as European representative of Canadian plant manufacturer. Willing to work first with firm in Canada to learn products. Apply to File No. 3215-W.

CIVIL ENGINEER, S.E.I.C., B.Sc., Alberta (1949). Age 30. Married, veteran. Desires employment in town planning and municipal field. Experience in surveying. Available on reasonable notice to present employer. Apply to File No. 3223-W.

MECHANICAL ENGINEER, B.Sc., Grad. I.M.E., 2 years Engineer Officer; one year steam turbine research. Anxious to obtain suitable position in Canada in research, design or teaching fields. Expecting to be in Canada around September, 1949. Apply to File No. 3229-W.

CIVIL ENGINEER, S.E.I.C., B.Sc., C.E., University of Manitoba, 1948. Age 23. Two summers, on field construction. One year on the construction of a reinforced concrete grain elevator and malting plant; one year on small structures. One summer drafting and detailing concrete reinforcing. Employed as Reinforced Concrete Designer and Estimator. Desire a position with consulting engineering firm or combined engineering and architectural company to design and to do construction estimating. Available shortly after notification. Apply to File No. 3230-W.

CIVIL ENGINEER, M.E.I.C., interested in obtaining spare time employment. Four years experience in reinforced concrete and steel construction covering design, supervision and surveying. Available evenings and weekends. Presently located in Montreal. Apply to File No. 3232-W.

ELECTRICAL ENGINEER, S.E.I.C., A.P.I., B.Sc. (E.E.) University of Saskatchewan, 1949. Age 25, married. Experience includes electrical contracting, wireless and radar in R.C.A.F. and maintenance of hydro plant. Desire employment in transmission or distribution. Apply to File No. 3238-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C. Desires position in pulp and paper mill or mining. Two year pre-graduation bench work in machine shops toolmaking and light metal manufacturing. 16 months as tool and process engineer for Westmount toolworks, D.I.L. 8 months as telephone equipment engineer. 6 months designing structure for auto-plane company, Dorval. 16 months with Dominion Engineering as process engineer for manufacture of diesel engines. Since March, 1947, have been engaged doing plant and production layouts for a pulp mill. This has involved structural design, reinforced concrete, foundations, pumps and piping and conveyors, machine design and general process layouts. Apply to File No. 3240-W.

Partner Wanted

PARTNER, wanted by engineer with 25 years experience, contemplating private practice. Must have necessary qualifications; previous experience with consulting engineer desirable. Apply to File No. 2642-W.

McGILL UNIVERSITY

Requires

Graduate Mechanical Engineers for Sessional appointment as Instructors and Demonstrators for 7 months from 1st October 1949 IN THE DEPARTMENT OF MECHANICAL ENGINEERING. Apply to File No. 1232-V giving qualifications and salary required.

SENIOR MECHANICAL ENGINEER

Senior Mechanical Engineer, to supervise the design of steam plant equipment, pressure vessels, plate work, structural steel and heavy machinery.

Must be a University engineering graduate, able to take charge of Engineering Department and direct technical and professional staff of fifty people, understand Canadian production and construction problems and deal with the public. Salary open, location Western Ontario, good living conditions, long established firm. For interview, write File No. 1202-V, including photograph and personal history.

Library Notes

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

A PROFESSIONAL GUIDE FOR JUNIOR ENGINEERS

By William E. Wickenden, edited by G. Ross Henninger. New York, Engineers' Council for Professional Development, c1949. 55 pp., paper, 8½ x 11 in., $1.00.

After eight years of talking, planning, and working, The Engineers Council for Professional Development has issued its guide to young engineers, under the above title. It has been a long time in the making but the results well justify the efforts of the author and the perseverance of E.C.P.D.

The late Dr. William E. Wickenden undertook the project in 1942. It was in the final stages when he died suddenly in 1947. This left the matter in suspense for a short time but eventually G. Ross Henninger, at that time editor of publications for the American Institute of Electrical Engineers, accepted the task of picking up the pieces and working them into a useful whole. The finished work was released in April of this year.

To Canadians Dr. Wickenden is famous primarily for his authorship of that classic paper "The Second Mile" which was his address to the 1941 Annual Meeting of The Engineering Institute in Hamilton. It is doubtful if in the engineering profession there is anyone whose ideas and writings on the non-technical aspects of the profession are better known or more highly regarded. His interest and his skill in these things have made him predominant in that field.

The Professional Guide is built around a lifetime of ideas and ideals of its author. It seems appropriate that this compendium of advice, wise counsel and reason should be his last message to the young engineer in whose education and professional status he took such a vital interest throughout his lifetime. Here is the masterpiece of the master.

The book is divided into sections to parallel the changing interest of the young man's life. It begins with a talk on "The Engineer's Heritage" and carries on through undergraduate to graduate, to professional practice, technical societies, registration, the difference between a trade and a profession, the demands of the latter and, finally, the engineer's relationship with his client, his employer and the public. The last chapter is an abridged version of "The Second Mile".

The book may well be the foundation of any young man's library. He could find no better beginning. It should be read carefully chapter by chapter and then re-read at frequent intervals throughout the professional development period by way of review and inspiration.

The following two paragraphs have been taken from the Foreword. They give succinctly the objective of the publication.

"This booklet has been written for and is dedicated to the young engineer. Its purpose is to give to young people seriously entering upon an engineering career an authentic introduction to, and insight into, the professional career of their choice. The advice and suggestions which it presents are drawn directly from the engineering profession's reservoir of accumulated experience, and are offered here in the hope of shedding light upon some of the vital personal questions which will be encountered, and of aiding thereby in the decisions which only the individual can make for himself.

"The planning of a career is of the utmost importance to each individual. It should start at least in high school and continuously be reviewed as collegiate work progresses. As collegiate work comes to a close and the threshold of a professional career is reached, a thorough re-evaluation and re-crystallization of plans for that career will be of especial value to the individual. In fact, career planning should be a continuing and growing activity throughout life. It is a hopeful objective of this booklet that it will help to reveal and identify some of the essential guide posts to a successful career."

L.A.W.

PATENT LAW, 2d ed

C. H. Biesterfeld. New York, Wiley; London, Chapman & Hall, c1949. 261 pp., 9¼ x 6 in., cloth, $4.00.

Reviewed by W. R. Meredith*

Engineers and executives curious to explore the subject of patents will find this book of more than ordinary interest and of continuing usefulness.

This book, a second edition, brings up to date and extensively revises the earlier work. The author is particularly well qualified, having been head of the patent department of E. I. du Pont de Nemours & Company, Inc. since 1926.

Although this book deals with the patent system of the United States, the basic principles of the Canadian patent system are almost identical, and Mr. Biesterfeld brings out these basic principles clearly, interrelates them comprehensively and illustrates them by well chosen quotations from court decisions.

The matters of priority as between rival inventors and interferences dealt with in Chapters IV and XIV exhibit considerable difference from the corresponding Canadian practice. Like considerations apply in connection with "contributory infringement". As stated in Chapter XV: in the United States a manufacturer may be guilty of contributory infringement merely by selling parts to another who assembles the parts to make an article which infringes a patent. Canadian law knows no such doctrine.

Keeping in mind that Biesterfeld's book does not deal with other than American patent matters, it is nevertheless one which any Canadian engineer would be well-advised to read.

**Barrister-at-Law, Ottawa, Canada.*

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Analytic Geometry and Calculus; a Unified Treatment:
Frederic H. Miller. New York, Wiley; London, Chapman & Hall, c1949. 658 pp., illus., cloth.

Design and Construction of Reinforced Concrete Bridges:
A. W. Legat, G. Dunn, and W. A. Fairhurst. London, Concrete Publications, 1948. 515 pp., illus., cloth.

Electric Power Transmission:
M. P. Weinbach. New York, Macmillan, 1948. 362 pp., illus., cloth.

Elementary Mathematics from an Advanced Standpoint; Geometry:
Felix Klein. Translated from the third German edition by E. R. Hedrick and C. A. Noble. 214 pp., illus., cloth.

Elements of Aerodynamics of Supersonic Flows:
Antonio Ferri. New York, Macmillan, 1949. 434 pp., illus., cloth.

Elements of Sound Recording:
John G. Frayne and Halley Wolfe. New York, Wiley; London, Chapman & Hall, c1949. 686 pp., illus., cloth.

Flood of 1948 in British Columbia:

C. E. Webb. Vancouver, Dominion Water and Power Bureau, 1949. 41 pp., 3 folded maps, charts, paper.

Frank and Lillian Gilbreth; Partners for Life:

Edna Yost. New Brunswick, Rutgers University Press, 1949. 372 pp., illus., cloth.

Hydrology:

Edited by Oscar E. Meinzer. New York, Dover, 1949. 712 pp., illus., cloth. (Physics of the Earth - IX).

Numerical Methods of Analysis in Engineering (Successive Corrections):

Hardy Cross and Others, edited by L. E. Grinter. New York, Macmillan, 1949. 207 pp., illus., cloth.

La Pierre; materiau du passé et de l'avenir:

Pierre Noël. Paris, Institut Technique du Bâtiment et des Travaux Publics, (1949). 112 pp., illus., paper.

Planning Industrial Structures:

Clarence W. Dunham. New York, Toronto, London, McGraw-Hill, 1948. 481 pp., illus., cloth.

B. C. A. S. Handbook of Pneumatic Equipment; 2d ed:

British Compressed Air Society. London, 1949. 194 pp., illus., cloth.

Pump Handbook:

Volney C. Finch. Millbrae, Calif., National Press, c1948. 202 pp., illus., cloth.

Quantitative Organic Analysis via Functional Groups:

Sidney Siggia. New York, Wiley; London, Chapman & Hall, 1949. 152 pp., illus., cloth.

Scavenging of Two-Stroke Cycle Diesel Engines:

Paul H. Schweitzer. New York, Macmillan, 1949. 268 pp., illus., cloth.

Slide Rule:

Lee H. Johnson. Toronto, New York, London, Van Nostrand, c1949. 242 pp., illus., cloth.

Terrestrail Magnetism and Electricity:

Edited by J. A. Fleming. New York, Dover, c1939, reprinted with corrections 1949. 794 pp., illus., cloth. (Physics of the Earth - VIII).

Waste-Heat Recovery from Industrial Furnaces; a Treatise based upon a Series of Papers presented to the Institute of Fuel:

Institute of Fuel. London, Chapman & Hall, 1948. 384 pp., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ETC.

Kungl. Tekniska Hogskolans. Handlingar:

No. 26—Mathematical Theory of Shaded-Pole Motors, Erik Morath.

National Research Council of Canada. Associate Committee on the National Building Code:

Proceedings of the 1949 Building Officials Conference (N.B.C. Report No. 1, prepared by R. S. Ferguson.)

Ohio Highway Engineering Conference:

Proceedings, 1949. (Engineering Experiment Station. Bulletin No. 136).

Society for Experimental Stress Analysis:

Proceedings, Vol. 6, No. 1, c1948.

Svenska Forskningsinstitutet for Cement och Betong Vid Kungl:

Meddelanden, No. 16, 1949.

TECHNICAL BULLETINS, ETC.

Canada. Geographical Bureau. Information Series:

No. 1—Introduction to the Geography of Newfoundland, by B. V. Gutsell.

Institute of Metals. Journal reprints:

Vol. 75 part 7—Constitution of Aluminium-Copper-Magnesium Alloys, by N. S. Bronmelle and H. W. L. Phillips.—Crystallite Theory of Strength of Metals, W. A. Wood and W. A. Rachinger.—Observations on the Recrystallization Characteristics of Aluminium-Magnesium-Manganese Alloys, R. Chadwick and W. H. L. Hooper.—Pure Platinum, of High Recrystallization Temperature, Produced by Powder Metallurgy, A. B. Middleton, and others.—Relation between the Degree of Order and the Lattice Parameter of Cu_3Au, by W. Betteridge.

Institution of Mechanical Engineers. Advance Papers:

Discharge of Exhaust Gases in Two-Stroke Engines, J. H. Weaving.—Fuel Anti-Knock Requirements of Automobile Engines, C. G. Williams.—Generalized Analysis of the Regenerative Steam Cycle for a Finite Number of Heaters, R. W. Haywood.—Mechanical Engineering in the Chemical Industry, F. H. Bramwell.—Total-Heat, Air-Ratio Diagram: a New Method for the Calculation of Gas-Turbine Cycles, Ernst Schmidt.—Yield Phenomena of a Medium Carbon Steel under Dynamic Loading, F. V. Warnock, and D. B. C. Taylor and Use of Plumber's Resin to Determine the Occurrence of Yield, J. S. Blair.

Princeton University. Industrial Relations Section. Selected References:

No. 28—Selection and Development of Executives.

Lehigh University. Annual Abstract:

No. 8—Bibliography and Abstracts of Publication of Lehigh University Faculty Members 1948.

PAMPHLETS, ETC.

Chronicle of the Aviation Industry in America, 1947-1948 Supplement:

Easton Manufacturing Co., Cleveland, c1949.

Engineering Literature and its role in Pan-American Development:

Edward P. Hamilton. New York, Wiley, 1949.

Informative Labeling Program; a business building program for individual companies at all levels of the Plastics Industry:

Society of the Plastics Industry, New York, 1949.

Job of Management at the Supervisory Level:

Waldo E. Fisher. Pasadena, California Institute of Technology, Industrial Relations Section, 1949.

Prairie Oil:

H. H. Hewetson. Sarnia, Imperial Oil Ltd., 1949.

Report of the Work of the Tin Research Institute, 1947-1948:

Tin Research Institute, Greenford, 1949.

Role of A University in Industrial Relations:

Lloyd G. Reynolds. Montreal, McGill University, Industrial Relations Centre, 1949.

What can the Small Plant do about Fly Ash:

Carl E. Miller. Bituminous Coal Research, Pittsburgh, 1949.

BOOK NOTES

The Institute does not assume responsibility for any statements made; these are taken from the preface or the text of the book.

Prepared by the Library of The Engineering Institute of Canada.

NEW CANADIAN STANDARDS

CANADIAN STANDARDS ASSOCIATION. STANDARDS:

B89-1948—Specification for 1½ inch Fire Hose Coupling Screw Thread. 50c.

Based essentially on the American Standards Association standard B33.1-1935, "Hose Coupling Screw Threads". The thread is that known as "Iron Pipe Standard" (straight thread), "V" pattern, the sides having an included angle of 60 degrees, truncated top and bottom.

C15(E)-1948—Specification for the Physical Properties and Preservative Treatment of Douglas Fir Poles. 50c.

General set-up is in line with the latest proposed revisions to A.S.A. Specifications and Dimensions for Wood Poles. Part I deals with the physical properties; Part II with the manufacture and preservative treatment. Ultimate fibre stress of 8,400 pounds per square inch has been specified.

C22.1-1947, Supplement No. 1—Tentative Interim Revisions to Canadian Electrical Code, Part I. 15c.

These revisions will be tentative until a new edition of the code is published.

C22.4, No. 102-1948—Tolerable Limits and Special Methods of Measurement of Radio Interference from Trolley Buses, Tramways and Electric Railways. (Canadian Electrical Code, Part IV—Radio). 50c.

Defines the tolerable limits of radio interference necessary to ensure radio reception conditions in accordance with the standards provided by other sections of Part IV in so far as is economically feasible.

C22.4, No. 103-1948—Tolerable Limits and Special Methods of Measurement of Radio Interference from High Voltage Lines and Apparatus. (Canadian Electrical Code, Part IV—Radio). 50c.

The tolerable limits specified are intended to provide a degree of protection to radio reception corresponding to that provided by Part IV.

G26-1949—Specification for Hot-Rolled Carbon Steel Bars, 4th ed. 75c.

Covers bars of two fundamental quality classifications: Merchant Quality, used for structural purposes and similar miscellaneous bar applications; and Special Quality, used for applications involving forging, heat treating, cold drawing, turning, or similar uses.

HA Series - 1948—Specifications for Aluminum and Aluminum Alloys. $2.50.

This series contains sections covering the inspection requirements common to aluminum and aluminum alloys; dimensional tolerances applicable to aluminum and aluminum alloys fabrication products; applicable specifications for ingot for remelting; specification for alloy sheet, plate and coil, wire, rod, bar, and shapes, rivet wire and rod, drawn tubing (seamless), forgings, sand castings, permanent mould castings.

Z91-1949—Code of Practice for Window Cleaning. 50c.

Applies to all window cleaning operations performed on the outside of all public buildings more than one story high, or in which the sills are more than ten feet above grade or adjoining flat roof, except for windows opening to balconies equipped with approved railings.

ALUMINIUM AND ITS ALLOYS:

S. A. J. Sage. Manchester, Emmott, 1948. 44 pp., illus., 7 x 5 in., paper, 2/6-. (Mechanical World Monograph No. 50).

This is a short summary of the properties of the following groups of aluminium alloys: aluminium-copper, aluminium-silicon, aluminium-magnesium and aluminium-zinc. It discusses also pure and commercial aluminium, complex alloys, the effect of alloying constituents in light metals, and the future trend in aluminium alloys.

BRITISH STANDARDS INSTITUTION. STANDARDS:

British Standards Institution, London.

Attachment and Drive of Circular Metal Cutting Saws for Cold Working. BS 387:1948. 2/-.

Gives fully detailed dimensions for the mounting of saws from 10 in. to 72 in. in diameter with centre holes from 1⅜ in. to 6 in. The loose flange type of drive is the one prescribed.

Dimensions of Ship's Stud Link Anchor Cables. BS 3006:1949. 2/6-.

Tables of the dimensions of assembled cables with bolt type joining shackles, end and enlarged links; proportions of these components in terms of the material of the common link are given.

Electrically Welded Mild Steel Chain (Short Link and Pitched or Calibration) for Lifting Purposes. BS 590:1949. 2/6-.

The maximum size is now 1½ in. and the wire gauge sizes for chain under $\frac{5}{16}$ in. are more nearly exact. In place of a minimum extension under a predetermined test load without fracture, a minimum energy absorption factor has been substituted.

Gear Hobbing Machines. BS 1498:1948. 2/-.

Lays down certain limitations to be taken into account in the design of hobbing machines in order to ensure adequate rigidity and to avoid appreciable errors that may occur in a gear cut on a machine with an undesirably small index gear.

Steel Plate Sheet and Strip; Addendum No. 1, September 1948. BS 1449: 1948. 1/-.

Deals with chromium rust resisting, high tensile chromium-nickel rust resisting, and austenitic chromium-nickel rust, acid and heat resisting steel sheet and strip.

Test Films for 16 mm. Cinematograph Projectors. BS 1488:1949.

May be used by manufacturers of 16mm. cine projectors for testing and adjusting, by dealers for testing, adjusting, and demonstrating new or repaired projectors and by users of projectors to maintain their equipment at peak performance.

CHAMBER'S FOUR-FIGURE MATHEMATICAL TABLES:

L. J. Comrie. Edinburgh, London; W. & R. Chambers Ltd.; Toronto, Smithers & Bonellie, 1947. 64 pp., 10¼ x 7¾ in., cloth, $2.00.

These tables represent an attempt to raise the standard of the four-figure tables used in schools, technical colleges and universities, as well as in industrial practice, and to bridge the gap between the schoolroom and the drawing-office. Explanations of tables are included.

DESIGN FOR WELDING:

R. S. Green, D. C. Williams, C. B. Smith, editors. Cleveland, Ohio, James F. Lincoln Arc Welding Foundation, 1948. 1024 pp., illus., 9 x 6 in., fabrikoid, $2.50 in Canada.

The purpose of this book is to make available a record of representative welded designs. Emphasis is placed on projects produced and in operation with the objective of providing engineers and industry generally with a variety of ideas which may be adaptable to their own products or structures. The book contains a liberal presentation of cost data on the various designs which afford a sound means of making a comparative study of methods.

FIRST COURSE OF MATHEMATICS; FOR STUDENTS OF ENGINEERING AND THE PHYSICAL SCIENCES:

Edward Baker. New York, Toronto, London; Van Nostrand, 1943. 295 pp., illus., 9¼ x 6¼ in., cloth, $4.00 in Canada.

The plan of this book is that of proceeding by easy stages from less difficult to more difficult subjects. Those treated are trigonometric functions and vectors; numerical computation; radian measure; solution of right triangles; rotating vectors; algebra; linear functions; simultaneous linear equations; the theory of exponents; logarithms; analytical trigonometry; oblique triangles; the quadratic function; complex numbers; algebraic and trigonometric equations; progressions; analytical geometry; the straight line; the conics; transformation of coordinates; polar coordinates; plane curves; three-dimensional geometry; derivatives and integrals; and permutations and combinations.

FUNCTIONS OF THE EXECUTIVE:

C. I. Barnard. Cambridge, Mass., Harvard University Press; Toronto, Saunders, 1948. 334 pp., 8½ x 5¾ in., cloth, $5.00 in Canada.

The author believes that there are universal characteristics of organization that are active understandings, evaluations, concepts, of men skilled in organizing. In this book he deals with the theory of cooperation and organization, and presents a study of the functions of the methods of operation of executives in formal organization.

GAS TURBINES AND THEIR PROBLEMS:

Hayne Constant. London, Todd Publishing Group; Toronto, Clarke Irwin, 1948. 158 pp., illus., 7½ x 5 in., cloth, $2.00.

After a brief account of the technical history which has led the gas turbine to its present day position, an attempt is made to explain on a physical rather than a mathematical basis the special problems of the gas turbine system; its advantages and limitations; the processes that are understood and the difficulties that have still to be overcome.

HEATING AND VENTILATING'S BUYERS' DIRECTORY, 1949 ed:

Industrial Press, New York, 1949. 236 pp., illus., 8 x 5¼ in., paper, $1.00.

This annual contains data about equipment and materials used in heating, ventilating, air conditioning, piping, and refrigeration. Included also is a list of manufacturers with their local representatives and branch offices, and a directory of trade names.

INSTRUMENTAL METHODS OF ANALYSIS:

H. H. Willard, L. L. Merritt, J. A. Dean. New York, Toronto, London; Van Nostrand, 1948. 247 pp., illus., 11 x 8½ in., paper, $4.50 in Canada.

This is an introductory course in the use of instrumental or physico-chemical methods of analytical chemistry. It is designed to gather together many of the theoretical and practical aspects of the subject; and to give an idea of the types of instruments available, advantages and disadvantages of each instrument, and a brief summary of the applications. References to further material are included throughout.

MANAGEMENT AND THE WORKER:

F. J. Roethlisberger and W. J. Dickson, assisted by H. A. Wright. Cambridge, Mass., Harvard University Press; Toronto, Saunders, 1947. 615 in., illus., 9½ x 6¼ in., cloth, $5.50 in Canada.

This is a report of investigations carried out at the Western Electric Company in Chicago, with the purpose of developing the understanding of human situations to help improve employee relations and aid in resolving the problems arising in them. The topics discussed are working conditions and employee efficiency; the improvement of employee relations; the understanding of employee dissatisfaction; the social organization of employees; and applications to practice of research results.

OUTLINE OF ADVERTISING FOR ENGINEERS:

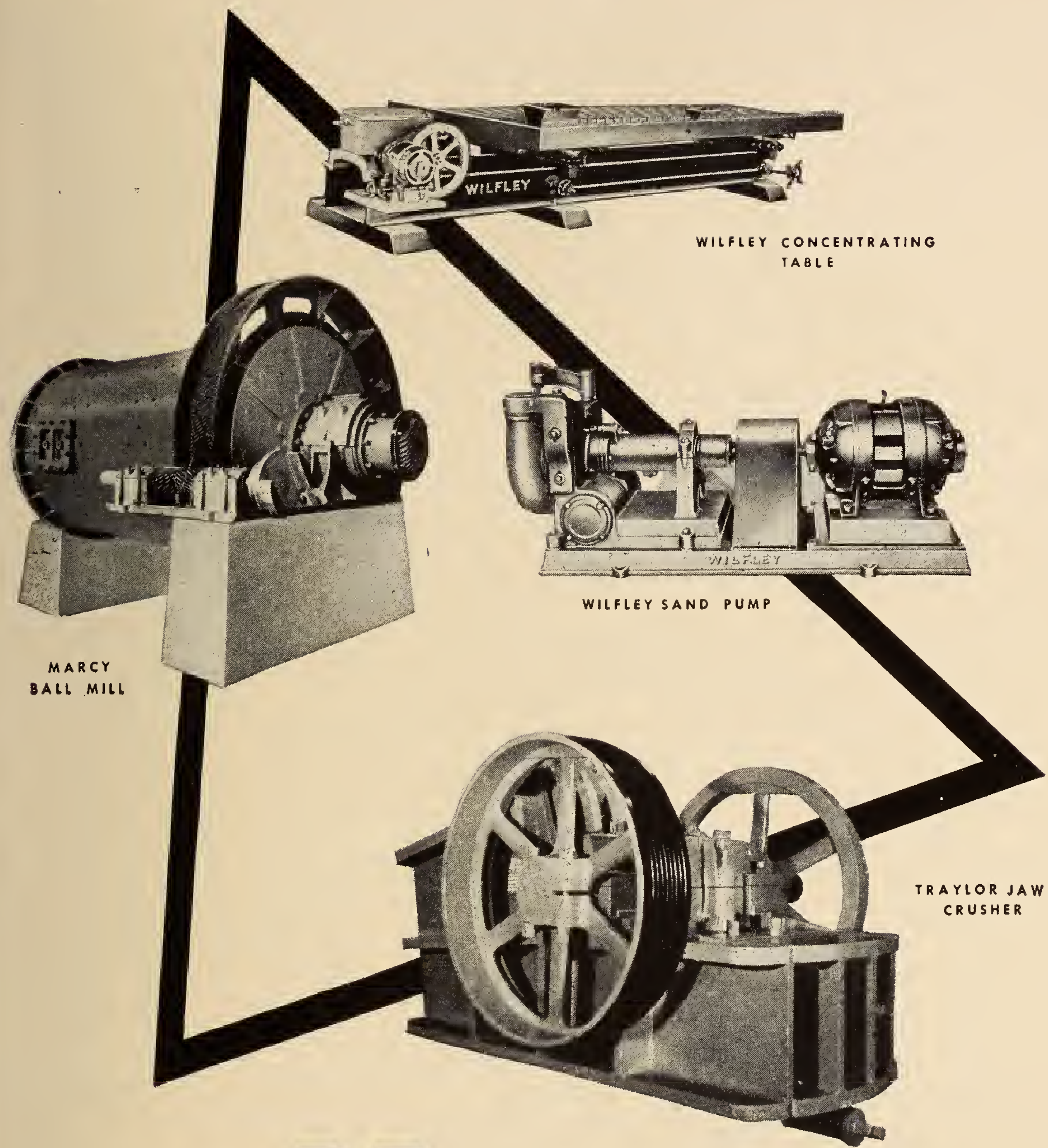
J. W. B. Tunstall. Manchester, Emmott, 1948. 36 pp., illus., 7¼ x 5 in., paper, 2/-. (Mechanical World Monograph No. 52).

This pamphlet stresses the need for good advertising by engineering firms. It discusses the organization of the firm's advertising; the selection of the advertising media; planning the advertisement; types of illustrations that should be used; how to buy blocks; catalogues and leaflets; distribution of advertising; the use of editorial services; and correction marks for proofs.

PARTNERS IN PRODUCTION; A BASIS FOR LABOR-MANAGEMENT UNDERSTANDING:

Labor Committee of the Twentieth Century Fund, assisted by Osgood Nichols. New York, Twentieth Century Fund, 1949. 149 pp., 8 x 5½ in., cloth, $1.50.

Dependable Equipment...



WILFLEY CONCENTRATING TABLE

WILFLEY SAND PUMP

MARCY BALL MILL

TRAYLOR JAW CRUSHER

CANADIAN VICKERS LIMITED
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Representatives in Principal Cities

The purpose of this document is to formulate a new philosophy of labour-management relations on which both labour and management can agree. The new approach is an attempt to get away from the philosophy of conflict and look at management and labour as human beings.

PHYSICS, 3d ed:

Erich Hausmann and E. P. Slack. New York, Toronto, London; Van Nostrand, 1948. 793 pp., illus., 9¼ x 6¼ in., cloth, $5.50 in Canada.

This text aims to present the essentials of Physics to college students who major in science, technology, or engineering. It is intended to give a gradual and logical approach to the subject, to develop and illustrate the fundamental concepts clearly, and to afford a mastery of the basic principles. The new edition includes recent developments as well as important practical applications of the principles of physics. Some of the new topics are: effects at supersonic speeds, electron accelerators, nuclear reactions, and atomic energy.

WHAT GOOD ARE STANDARDS?

American Standards Association, New York, 1949. 47 pp., illus., 11 x 8½ in., paper, $1.00 to A.S.T.M. members, 75c. to non-members.

These papers were presented at the 1948 annual meeting of the Association, and include discussions of such important problems as the legality of standardization work of the Munitions Board, and the functions of standardization in such company operations as purchasing, manufacturing, and marketing. The importance of strandardization to wholesalers and retailers, and to the ultimate consumers, as well as to manufacturers, is dealt with.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

AMERICAN SOCIETY FOR TESTING MATERIALS, Proceedings, Volume 48, 1948, Committee Reports and Technical Papers.

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1949. 1354 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $12.00 (A.S.T.M. members $8.00).

This annual volume contains all reports and papers offered to and accepted by the Society during the year indicated. The table of contents and the subject and author indexes cover all papers and reports published by the Society during the year including Special Technical Publications and material appearing in the ASTM Bulletin. Discussions accompany their respective papers, and a synopsis of each paper is provided.

BIBLIOGRAPHY ON WATER AND SEWAGE ANALYSIS. (Special Report No. 28).

B. H. Weil, P. E. Murray, G. W. Reid and R. S. Ingols. Georgia Institute of Technology, State Engineering Experiment Station, Atlanta, Ga., 1498. 215 pp., 9 x 5½ in., fabrikoid, $4.00 ($4.50 foreign).

This broadly classified guide to the pertinent literature on water and sewage analysis lists some 2,600 items published prior to January, 1948. References have been sorted according to subject under "tests" for various materials and properties. In addition access to references may be made by "methods of analysis" and an author index.

BIBLIOGRAPHY ON X-RAY STRESS ANALYSIS WITH SUBJECT INDEX.

H. R. Isenburger. St. John X-Ray Laboratory, Califon, New Jersey, 1949, 17 pp., diagrs., 11½x8¾ in., stiff paper, $3.00.

Covering the period from 1925-1948, this bibliography contains 240 references covering methods, results and interpretations, in chronological order. A subject index has been added to facilitate the use of the bibliography.

COSMIC RAY PHYSICS.

D. J. X. Montgomery. Princeton University Press, Princeton, New Jersey; S. J. Reginald Saunders, Toronto, 1949. 370 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50 in Canada.

Emphasizing the experimental aspect, this book presents a survey of the entire field of cosmic ray studies. It is intended for those with intermediate or advanced training in branches of physics other than cosmic rays. It is not a laboratory handbook nor does it give a definitive historical treatment, but discusses and explains various experimental techniques. Principles underlying the operation of some cosmic ray apparatus are given, and the various components of cosmic radiation are discussed.

ELEMENTS OF APPLIED HYDROLOGY.

D. Johnstone and W. P. Cross, Ronald Press Company, New York, 1949. 275 pp., illus., diagrs., charts, maps, tables, 9½ x 6 in., cloth, $5.00.

Intended for use as an undergraduate text, this book sets forth some of the fundamentals of hydrology and encourages an analytical approach to the solution of problems. A knowledge of the Bernouilli theorem, general concepts of uniform flow in open channels, and critical depth and energy gradient is assumed as well as elementary calculus and the concept of least-squares adjustment. References are given at the end of each chapter and sets of problems at the text.

ENGINEERING LAMINATES.

Edited by A. G. H. Dietz. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 797 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $10.00.

Written by twenty-four experts, this books is of interest to those concerned with the design, manufacture and use of structural materials. It explains the mechanics of laminate materials from basic properties, through physical and chemical properties, to industrial uses. Among the wide range of types and topics discussed are plywood, sandwich-type building panels, clad metals, glass-lined steel, sprayed coatings, and laminating adhesives. Decorative laminates are not considered. Extensive chapter bibliographies are provided.

ENGINEERING THE NEW AGE.

J. J. O'Neill. Ives Washburn, Inc., 29 West 57th St., New York, 1949. 320 pp., tables, 8¼ x 5¼ in., cloth, $3.50.

This books presents the story of the individual and the role he will play in the unfolding of the new era in which all our resources are directed toward human welfare. It considers the relationship of man to the cosmos, man to man, and man to his community. It finds an underlying pattern which provides a blueprint for progress in accordance with the methods established by the engineer and scientist.

FOUNDATIONS OF NUCLEAR PHYSICS, with Bibliography compiled by R. T. Beyer.

Dover Publications, New York, 1949. 272 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., cloth, $2.95.

This book contains facsimiles of thirteen previously published fundamental studies as originally reported by the investigators. It also provides a comprehensive but unannotated bibliography of over 5,000 references to articles, clsssified under broad subject headings. Only last names of authors are given and only the first page of each article.

HOW TO KEEP INVENTION RECORDS.

H. A. Toulmin, Jr. Research Press, Dayton, Ohio, 1948. 78 pp., tables, 8 x 5¼ in., cloth, $2.50.

Dealing with the measures necessary to protect patentable material, the first part discusses the general nature of industrial property and monopolies granted to protect it. In the second part, a practical method of insuring the recording of dates is presented in a series of a dozen forms. A final chapter deals with the methods of patent investigation.

METALLURGICAL STUDY OF GERMAN AIRCRAFT ENGINE AND AIRFRAME PARTS, Part II.

By the Aero Component Sub-Committee of the Technical Advisory Committee to the Special and Alloy Steel Committee, arranged by C. A. Otto. Kennedy Press Ltd., 31 King Street West, Manchester 3, and Bedford Street, London, W.C. 2, England, 1948. 110 pp., illus., diagrs. charts, tables, 9¼ x 5¾ in., cloth, 10s.6d.

This report constitutes a summary of data resulting from metallurgical examination of German aircraft engine and airframe parts. It contains information on the types and qualities of the materials used, methods of manufacture, efficiency of the heat-treatment to which the parts have been submitted, and other pertinent subjects. Special features concerning design are noted in certain instances. No comparisons are made with corresponding parts in British and American aircraft.

PROPERTIES OF SOFT SOLDERS AND SOLDERED JOINTS. (Research Monograph No. 5).

J. McKeown, with a foreword by H. Moore. British Non-Ferrous Metals Research Association, Euston Street, London, N.W.1, 1948. 118 pp., illus., diagrs., charts, tables, 10 x 6 in., cloth, 17s. 6d.; $4.00.

This monograph describes the work carried out and the results obtained in a war-time research on solders of varying composition. The section on soldering power tests includes bit-soldering, area of spread, and capillary penetration tests. The section of mechanical properties covers bulk solders, hot tearing, and creep and fatigue tests on soldered joints.

RADIOACTIVE MEASUREMENTS WITH NUCLEAR EMULSIONS.

H. Yagoda. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 356 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

This coordinated study on the use of photographic emulsions in measuring radioactivity explains the principles under-

lying the chemical and photographic operations involved, and describes working methods in the fields of biology, radiochemistry, metallurgy, mineralogy, and nuclear physics. The bibliography includes 700 items dealing with the use of photographic emulsions in radioactive measurements.

ROYAL SOCIETY EMPIRE SCIENTIFIC CONFERENCE, June-July 1946, Report, 2 Vols.

Royal Society, Burlington House, London, W.1, England, 1948. Vol. 1, 828 pp.; Vol. 2, 707 pp., diagrs., charts, maps, tables, 8½ x 5½ in., cloth, £2. 2s., two volumes.

This two-volume report covers the following topics in their relation to the British Empire: organization, cooperation, and interchange in scientific research; scientific information services and the collection of scientific records; agricultural science; medical science; nutrition; mapping by air; land utilization and conservation; mineral and other natural resources; postwar needs of fundamental research. The volumes also include a miscellaneous group of papers on a variety of other topics, and some information on the purpose and organization of the conference.

TABLES OF THE CONFLUENT HYPERGEOMETRIC FUNCTION F $\left(\frac{n}{2}, \frac{1}{2}; x\right)$ AND RELATED FUNCTIONS.

(National Bureau of Standards, Applied Mathematics Series 3).

United States Government Printing Office, Washington, D.C., 1949. 73 pp., diagrs., tables, 10¼ x 8 in., paper, $0.35.

These tables, of importance in connection with the so-called analysis-of-variance tests, are also intended to facilitate the construction of other tables needed for sequential analysis and various other statistical tests. The tables are carried out to six decimal places. The analytical properties of the function are discussed, and a group of interpolation charts are included with explanation.

THEORY OF MODERN STEEL STRUCTURES, Volume II. Statically Indeterminate Structures and Space Frames.

L. E. Grinter. Revised edition. Macmillan Co., New York, Toronto; 1949. 312 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $5.25.

Intended as a text for advanced undergraduates, this volume considers statically indeterminate structures and space frames in a detailed manner. The largest changes in the revised edition occur in the material on the analysis and design of indeterminate structures, of arches and closed rings, and of continuous frames by moment distribution. Problems are found in the text along with the section to which they relate.

WEAR AS APPLIED PARTICULARLY TO CYLINDERS AND PISTON RINGS

F. P. Bundy, T. E. Eagan and R. L. Boyer. Cooper-Bessemer Corporation, Mount Vernon, Ohio, 1948. 129 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50.

Based on research and development work, this book presents in the first section the basic theory of friction and wear and the results of various wear tests. The second part covers metallurgical considerations in wear resistance, and the third is devoted to design aspects of cylinder and piston ring wear. There is a bibliography.

FOUNDATIONS OF MODERN PHYSICS, 2d ed:

T. B. Brown. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 391 pp., illus., diagras., charts, tables, 9¼ x 5¾ in., cloth, $5.00.

Considering the descriptive, theoretical, experimental and practical aspects, this book explains the experiments and discoveries by which the theories of modern physics have been established. Some of the recent developments in physical knowledge added to this new edition are in microwaves, radar, nuclear physics, cosmic rays, kinetic theory and electronics. A background of elementary algebra and geometry is assumed, but the use of advanced mathematics is avoided.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

HOW TO SOLVE PROBLEMS IN STEAM POWER ENGINEERING.

S. J. Tracy, Jr. Thomas Y. Growell Company, New York, 1948. 152 pp., diagrs., charts, tables, 8½ x 5½ in., paper, $1.25.

This book provides a comprehensive collection of problems embracing the application of all thc basic principles of steam power theory. Step-by-step solutions for each phase of the subject are given rather than mere variations of a limited set of data. In each chapter the problems have been arranged to provide a logical sequence in the analysis and development of the major topics.

ELECTRIC GENERATORS, OPERATION AND MAINTENANCE.

E. J. Kates and H. E. Stafford. American Technical Society, Chicago, 1948. 268 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $2.75.

The purpose of this book is to supply the information needed to decrease breakdowns, save time in analyzing difficulties, and aid in making speedy repairs to electric generators and motors. It is assumed that the reader understands the basic principles by which an electrical generator operates. Considerable explanation is given to voltage regulation, and the parallel operation of generators is treated in a practical manner.

PRACTICAL PROBLEMS IN SOIL MECHANICS.

H. R. Reymolds and P. Protopapadakis. Crosby Lockwood & Son, Ltd., London, 1948. 205 pp., illus., diagrs., charts, tables, 9 x 5½ in., cloth, 18s.

The object of the authors has been to present in as simple a form as possible the application of soil-mechanics methods and analyses to practical problems such as may occur in the experience of the practising engineer. The essential features of soil-mechanics studies have been assembled and discussed, with a minimum of mathematics, to provide a treatment bridging the gap between the theoretical text book and actual practice.

RADIO RECEIVER DESIGN, Part II.

K. R. Sturley, John. Wiley & Sons, New York, 1948. 480 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $5.50.

This book is an American reprint of the original British edition. It contains a full discussion of the progressive stages involved in the design of radio receivers for FM and television reception. Starting with audio frequency amplifiers, it deals with the power output stage, power supplies, automatic gain control, and various types of frequency control. This volume is a logical extension from Part I which covered aerial design, radio and intermediate frequency amplifiers, and receiver detector stages.

RECOMMENDED PRACTICES FOR SAND CASTING ALUMINUM AND MAGNESIUM ALLOYS.

Compiled and published by American Foundrymen's Association, 222 W. Adams St., Chicago 6, Illinois, 1948. 55 pp., illus., tables, 9 x 6 in., paper, apply.

General recommendations are given for molding, melting and pouring, cleaning and finishing, heat treatment, welding, and the prevention of special defects. The pamphlet also includes the development, chemical control limits, physical properties, conforming specifications, and field of use of certain specified alloys.

STANDARD DESIGN OF REINFORCED CONCRETE ROAD BRIDGES.

L. E. Hunter with a foreword by R. S. Murt. Chapman & Hall ,Ltd., London, 1947. 174 pp., diagrs., charts, tables, 9 x 6 in., cloth, 25s.

Of interest to the civil engineer who has to deal with highway bridge problems, this book gives complete design information. It contains many useful tables for the rapid design of fixed arches, slabs, beams and culverts. Necessary essential mathematical analysis is included. A special chapter considers steel girder bridges.

SUPERSONICS, THE SCIENCE OF INAUDIBLE SOUNDS.

R. W. Wood. Brown University, Providence, R.I., 1939, reprinted 1948. 152 pp., illus., diagrs., charts, tables, 7¾ x 5 in., cloth, $2.00. (The Charles K. Colver Lectures 1937).

This small volume, originally published in 1939, has been reprinted with an additional bibliography of 48 items from the period 1936-47. The text covers the history of supersonics, mechanical and electrical sources of inaudible sound, and the physical and biological effects of high-frequency sound waves.

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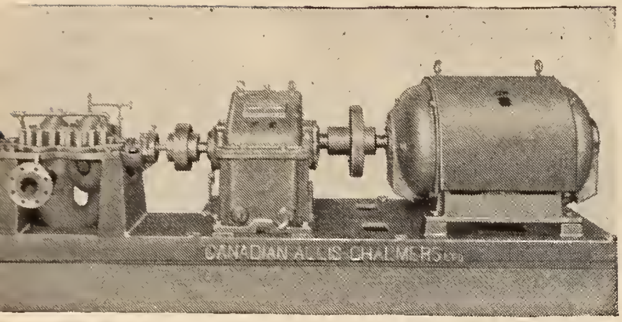
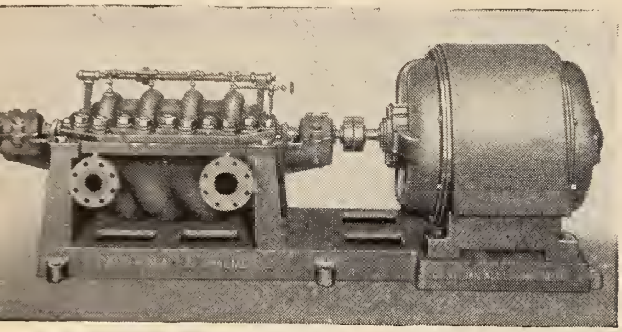
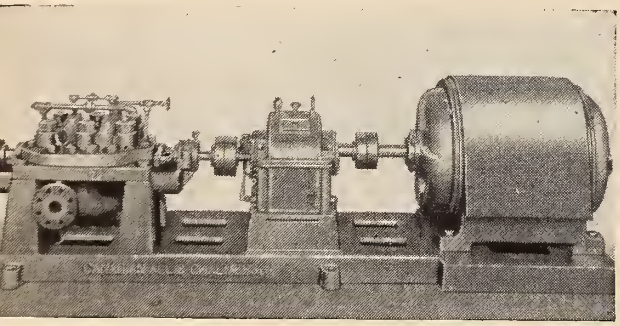
PUMPS



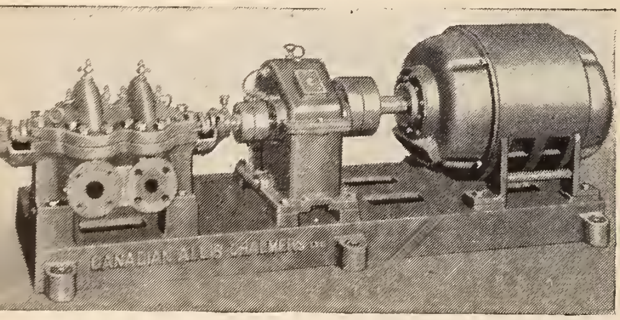
CA-C, 6" suction, 4" dischorge type "MM", two stage, double-suction, stoinless steel pump. Roted 600 Imp. G.P.M. ogoinst 1125' head, 3550 rpm driven through step-up geor by 300 hp, 1470 rpm motor.



C A-C type "M", 4-stage, double-suction, boiler feed or high pressure centrifugal pump.



High-heod mine pumping unit. Type "MM", two-stoge, double suction, extro heovy centrifugol pump, driven through herring bone gear, speed increoser. Motor speed is 1450 rpm which is increased to 3500 rpm ot the pump.



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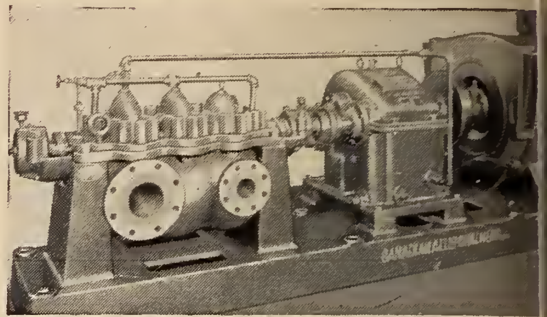
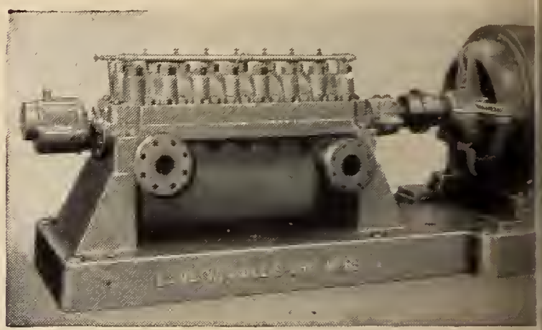
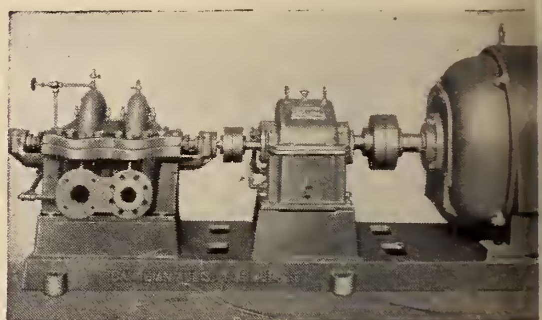


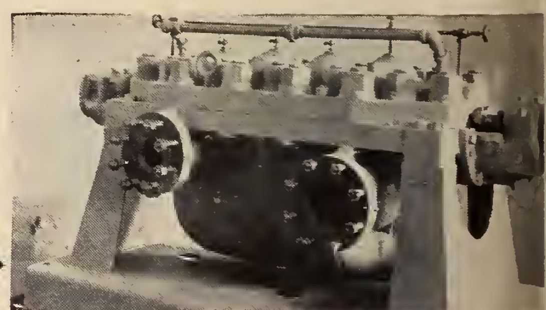
C A-C type "CMSK", size 5" by 3", 3-stage, double-suction bearing stainless steel mine pump. Capacity 360 U.S., G.P agoinst 1075 feet head at 3500 rpm.



C A-C type "M" 6-stage double-suction, high-pressure pump d by 400 horsepower, 1800 rpm motor.



C A-C type "CM" mine pumping unit consisting of a 3" suc 2½" dischorge, 2-stage, double-suction, ball-bearing pump.



C A-C type "M" high-pressure with ring—oiled bearing 6" x double-suction four-stage pump. Copocities up to 1000 G.P ogoinst heods up to 2000 feet ot 3500 rpm.

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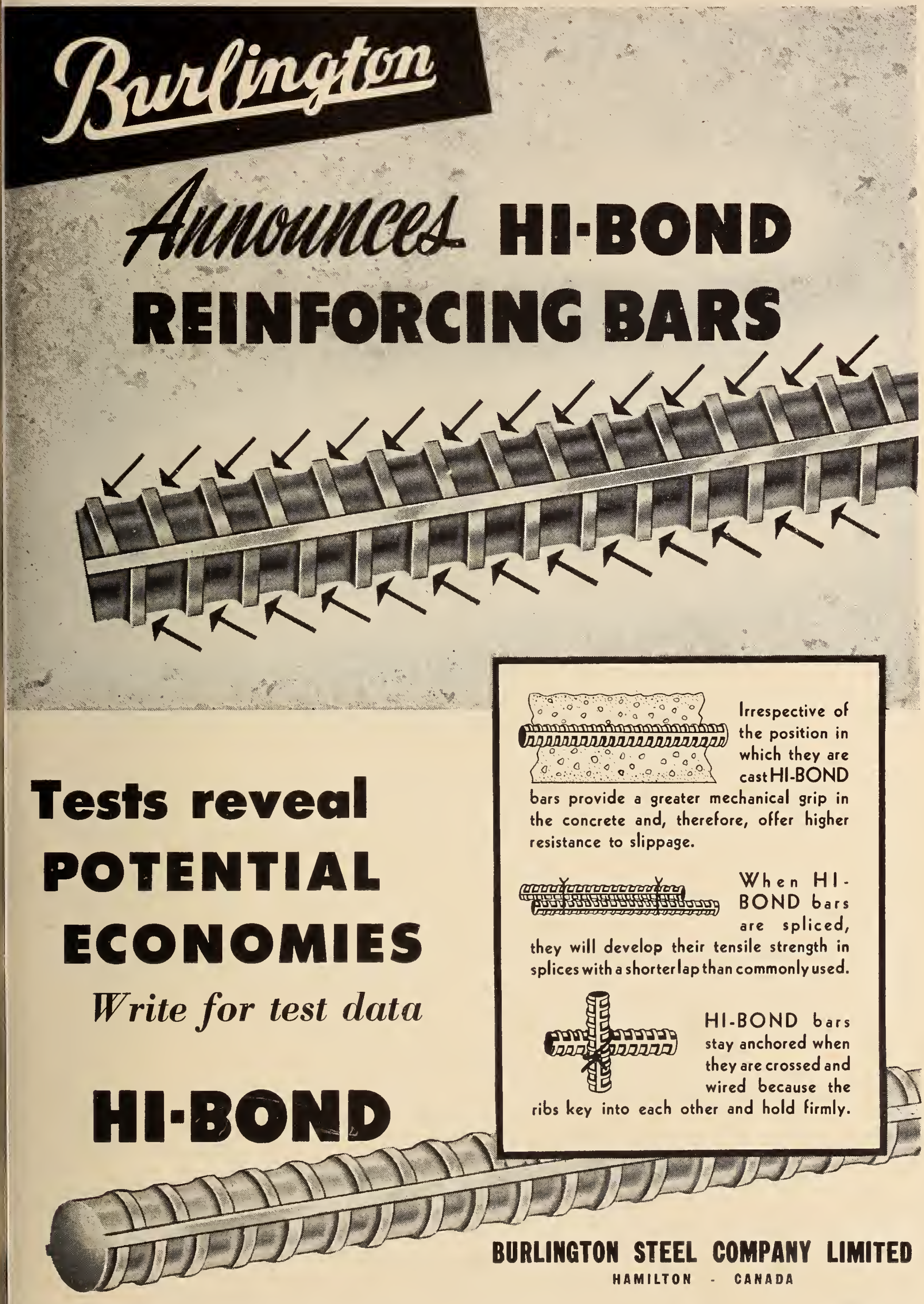

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BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information
received by
The Editor

New Equipment and Developments

Professional industrial designers in Canada have formed an organization to be known as the Association of Canadian Industrial Designers. The purpose of the Association is to set up standards common to all for the furtherance and development of "Made in Canada" products. The president is G. Englesmith, a lecturer at the University of Toronto.

•

The Steel Company of Canada, Limited has announced a new deformed concrete reinforcing bar rolled from new billet steel to C.S.A. Specification G-30-48. The bar will conform to the Company's "Hi-bond" design and will have the same bending characteristics as plain round bar made from the Company's new billet steel. Complete details may be obtained from the Company.

•

The trees that George Washington planted at Mount Vernon have been wired for protection against lightning. The work was carried out by the Westinghouse Company and the following statement was made by Edward Beck, one of the Company authorities on lightning: "One of the principal reasons why lightning rods were in disrepute for some years is that in many cases little attention was given to careful grounding. Lightning rods can be very effective if the teachings of Benjamin Franklin, augmented by the later experimental data that was denied him, are observed."

According to Westinghouse data, an isolated building 100 feet square and 30 feet high is likely to be struck by lightning on the average of once every 10 or 15 years. By the seemingly simple precaution of putting a mast or lightning rod 55 feet high on top of the roof, the building itself then would be hit only once in 8,200 years. The mast, however, would be struck every three years with no damage resulting to either mast or building.

•

Suclar Laboratories, Inc., 306 Halsy Street, Newark, New Jersey announce a new electronic safety starter designed to eliminate the danger of fire losses, short circuits, and transformer burnouts in fluorescent lamp fixtures. The unit is designed to fit any size of fixture.

•

More than 140 new American Standards, approved since January of this year, are included in the midyear list of standards and special publications just issued by the American Standards Association. The list shows a total of 1124 standard specifications, methods of test, building requirements, dimensions, safety codes, definitions, and terminology in all fields of engineering as well as for materials and equipment used by the ultimate consumer.

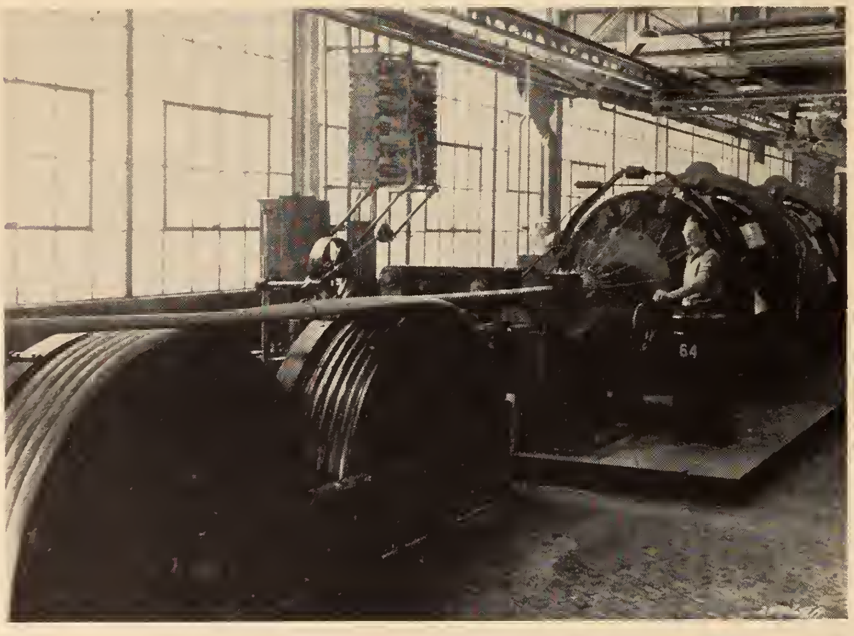
Important new standards listed for the first time include a series on chemicals used in photographic processing, soap specifications, lamp dimensions and electrical characteristics, textiles, electrical indicating instruments, building code requirements on signs and outdoor display structures. There are also two new standards in the series on small tools and machine tool elements and a recently completed standard plumbing code. Details may be obtained from the American Standards Association, 70 East 45th Street, New York 17, N.Y.

•

Verd-A-Ray Electric Products Ltd., 380 Craig St. W., Montreal 1, announce an industrial indicator fluorescent starter for which the following claims are made:

It shows at a glance whether the defect is in the starter or in the bulb.

(If the indicator does not flash regularly when the switch is on, the starter



This galvanized steel strand, passing around a double drum capstan at the Williamsport, Pa., plant of the Bethlehem Steel Co., measures 2½ inches in diameter. It is one of the largest made in the United States to date. 22,000 feet of the strand were fabricated for the main cables of two Colombia, South American highway suspension bridges. Both bridges are over the Cauca river. One, on the Carretera Aguadas-Arma-La Pintada, weighs 500 tons and has a suspension span of 160 meters. The other, over the Carretera La Union-Victoria, weighs 520 tons and has 164 meter suspension span. Strand was similarly made later for the El Comercio Bridge over the Cauca at Cali. It has 110 meter suspension span and weighs 484 tons. Bethlehem is the designer and steel supplier for all three bridges.

The strand was made on the plant's new 61-spool planetary strander which is 220 feet long. The main body (right) of the strander, with the 22 inch spools carried in cradles, revolves. Wires are pulled off the spools under considerable tension and run through the lay-plate whose holes are positioned to correspond to the arrangement of the wires in the strand. The wires then pass through a hardened steel die corresponding to the diameter of the strand. The strand in the picture comprises 147 wires.

is defective and should be replaced. When the window indicator flashes regularly and the tube does not light, tube should be replaced.)

It is claimed that extra testing equipment is not required when these industrial indicator starters are used. The Canadian Standards Association Laboratories have approved these starters.

•

Development of an in-plant health service is now under way at the Trail operations of The Consolidated Mining and Smelting Company of Canada, Limited. Designed to eventually give consultation service for indispositions other than first treatment for injuries, the programme is complementary to the Company's safety and hygiene department's pre-placement medical and periodic check-up required of employees in certain jobs at the metallurgical and chemical plants. The new service is under the direction of the company's medical consultant, W. S. Huckvale.

•

W. R. McCaffrey, Canadian Standards Association general manager, reported that shipbuilders are moving toward standardization. He said that committees of the C.S.A. Canadian shipbuilding interests are studying means whereby standards for marine valves and fittings can be adopted. These must be acceptable to the engineering services, the Royal Canadian Navy and Canadian shipbuilders whose work is connected with the Navy and the Merchant Marine. The interests concerned are Canadian manufacturers of marine valves and fittings, the Royal Canadian Navy, the Canadian Shipbuilding and Ship Repairing Association, the Canadian Maritime Commission, the Board of Steamship Inspection and classification societies.

•

Development of a new type of lubricating oil, designed to reduce corrosive wear and ring groove deposits in high speed Diesel engines, is claimed by McColl-Frontenac Oil Co. Ltd. The new product is known as Ursa Oil Super Duty and it is available in SAE grades of 10 and 30. It is recommended for use with Diesel fuels having sulphur contents of 0.5 per cent or higher and for severe operating conditions which require a high quality lubricating oil. Complete details may be obtained from the executive offices of the Company, Royal Bank Building, Montreal, Que.

•

On July 25th it was reported that demolition of the old Hotel Vancouver is proceeding at a rapid pace. Large quantities of steel are being recovered from the 34-year-old structure. By means of oxy-acetylene cutting equipment structural members are being cut to desired lengths and being used for new construction work. Material which cannot be salvaged for further use is being returned to local steel plants where it is being remelted.

•

Canadian Patents and Development Limited, incorporated as a Crown company early in 1948, provides a means of making available to industry, through licensing arrangements, new processes and improvements in processes developed by scientific workers in the National Research Council. Widespread interest is being shown in the Company's activities. In response to requests received for identification of the patents available for licensing, the Company has issued a handbook in which are given titles and patent references for the information of industrial firms. The handbook lists 64 patents issued and eight applications pending.

Twelve deal with aeronautical subjects, twenty-eight are chemical patents, and others deal with such items as laminated plywood structures, plastics, poultry plucking, and the design of containers for perishable commodities. Enquiries should be directed to the Canadian Patents and Development Ltd., National Research Building, Sussex Street, Ottawa, Ont.

•

Switchcraft Inc., 1328 N. Halstead St., Chicago 22, Ill., announces a new small lever action switch which, it is claimed, offers many desirable features of the telephone type switch at relatively low cost. The switch is recommended especially for use on all types of low power switching applications such as television antenna rotors, small electric trains, communication radio, amplifiers, sound systems, etc.

•

The 21st Annual Metal Exposition and Congress — of the U.S. — will be held in the Auditorium, Cleveland, Ohio, from October 17th to October 21st, 1949.

•

On July 20th an oil-burning steam locomotive, first in a series of conversions which will make all main-line Canadian Pacific passenger power between Winnipeg and Calgary oil-burn-

BAILEY METERING EQUIPMENT CONTROLS NEW, ULTRA-MODERN PLANT

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GREATER efficiency and safety ... improved power service ... lower operating costs ... these and many other advantages result from the installation of Bailey steam-plant meters and controls.

Featured above is a typical modern Bailey installation at Marathon Paper Mills, Marathon, Ont., where the two pulverized coal-fired boilers are completely equipped with Bailey metering and air-operated automatic combustion control equipment. The lime kiln and both recovery boilers are also provided with a full quota of Bailey metering and control equipment.

If you are interested in operating your steam plant more efficiently and economically, call in your local Bailey engineer ... he'll be glad to help you. Or, write us for Bulletin 15-C which briefly describes Bailey meters and controls for steam plants.

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HEAD OFFICE: 1980 CLAREMONT AVE., MONTREAL

BRANCH OFFICES: HALIFAX TORONTO WINNIPEG VANCOUVER ing, left Winnipeg pulling the transcontinental Dominion westbound. The locomotive was a 2,800 class Royal Hudson and it was converted from coal to oil at the Weston shops of the Company. It is the first of 16 locomotives to be so treated. It will burn Alberta oil. E. G. Bowie, superintendent of motive power and car equipment, who supervised the switchover, stated that the entire order will be finished by February 1950. Oil storage facilities are being provided at Winnipeg, Moose Jaw and Calgary, which will be the refuelling points.

•

Shell Oil Company has taken up approximately one million acres of Crown land under geophysical permit in the Wood Mountain area of Saskatchewan.

Dr. C. F. W. Hames, Deputy Minister of Public Health, Saskatchewan, has urged extreme caution in the handling and disposal of burned-out fluorescent lamps.

Dr. Hames said, "The thin glass of the tube is coated on the inside with beryllium. The glass is easily shattered and, if tiny particles of it get under the skin, the powdery substance may delay healing of wounds and lead to chronic inflammation and tumor-like growths."

Persons injured by broken glass from fluorescent tubes should remove the visible splinters at once, apply a boracic acid dressing, and receive medical attention. Immediate care is advised.

•

In Norway the production figures for agriculture, forestry, whaling and industry for the first quarter of 1949 were above the estimates in the National budget. The production index for export industries for the period is 27% higher than for the corresponding period last year.

•

The Dominion Bureau of Statistics reports that the output of electric energy by central electric stations during May of this year was 5% higher than in the same month a year ago. The output is the highest ever recorded for any single month. All provinces shared in the May advance. All provinces had higher outputs for the five-month period, January to May, with the exception of Quebec.

•

Field studies by power-regulating officials from Canada and the U.S. are reported to indicate that a recommendation will be made for the building of gates across the Niagara river near the Peace Bridge connecting Buffalo, N.Y., and Fort Erie, Ontario. It is said that the control works in the St. Mary's River at Sault Ste. Marie gave the idea for the gates. The engineers report that the Niagara Falls Power Company is prepared to spend sixty million dollars for a new power station to be located near Lewiston, N.Y., and it is also reported that the Ontario Hydro-Electric Power Commission plans to spend seventy million dollars at Queenston, Ontario, for the erection of a plant.

•

During the current year the Ontario Government spent twenty million dollars on rural hydro extension, and it is anticipated that it will serve thirty-five thousand new consumers.

•

The Consolidated Mining & Smelting Company of Canada Limited is the largest lead and zinc producer in the British Empire.

•

Canadian mines produced more coal in 1948 than in any year since 1942. The year's output was 18,450,000 tons—16% higher than in 1947. Imports of coal in 1948 increased 1.6% over the 1947 imports, but exports were 78% over the 1947 figures.

•

Reduction in construction costs and increased efficiency in the field of building regulations was the object of a two-day Building Officials' Conference held, recently, in the National Research Building, Ottawa. The conference was sponsored by the Associate Committee on the National Building Code. A full account of the discussions is contained in the committee's Report No. 1, which may be obtained from the National Research Council, Ottawa.

In particular, specific direction was given by motion for: (1) the discussion of provincial building legislation by the Provincial Representatives and the Associate Committee with a view to obtaining uniformity, and enabling legislation to ease adoption of model documents; (2) continuance of the Building Officials Meeting as an annual congress; (3) publication of three building code documents to cover the needs of the small, medium and large municipalities.

A system of three-dimensional photography is reported to have been perfected by Dr. F. H. Reinders of Holland. A thirty-five minute newsreel film, partly in colour, has been made with a double 16 mm. camera constructed by a Dutch engineer, F. A. Weber, who worked under Dr. Reinders' instructions.

The system has been internationally patented. It is reported that any scene can be readily photographed without any special preparation, and that the projection results are in lifelike three-dimensional images. The system is being demonstrated at the Hague.

•

The Dutch Minister of Reconstruction and Housing recently opened an international centre, in Rotterdam, for the building industry.

The centre is designed to be an international institution for the purpose of supplying information, both written and oral, on the art of building and allied branches of industry.

•

In 1939 the average weekly wage in Canadian manufacturing plants, based on a 47-hour week, was $23.11. In 1948 the average wage for a 43-hour week was $40.91. Gross national production in 1939 was $5,598 millions and in 1948 the corresponding figure was $15,419 millions. Exports in 1939 were valued at $1,461 millions and at $4,037 millions last year.

•

In 1948 Venezuela produced 14% of the world's oil supply and collected four hundred and eleven million dollars in revenue. Approximately 94% of the output was exported. The United States and Europe each took about 33 1/3% and Canada 9%.

•

The chief European producers of iron ore, France, Germany, Great Britain and Sweden all created post-war production records in 1948. Tonnages for the present year are above those reported for the corresponding months of last year.

•

The 1949 edition of the Canadian Trade Index lists ten thousand manufacturing firms operating in Canada.

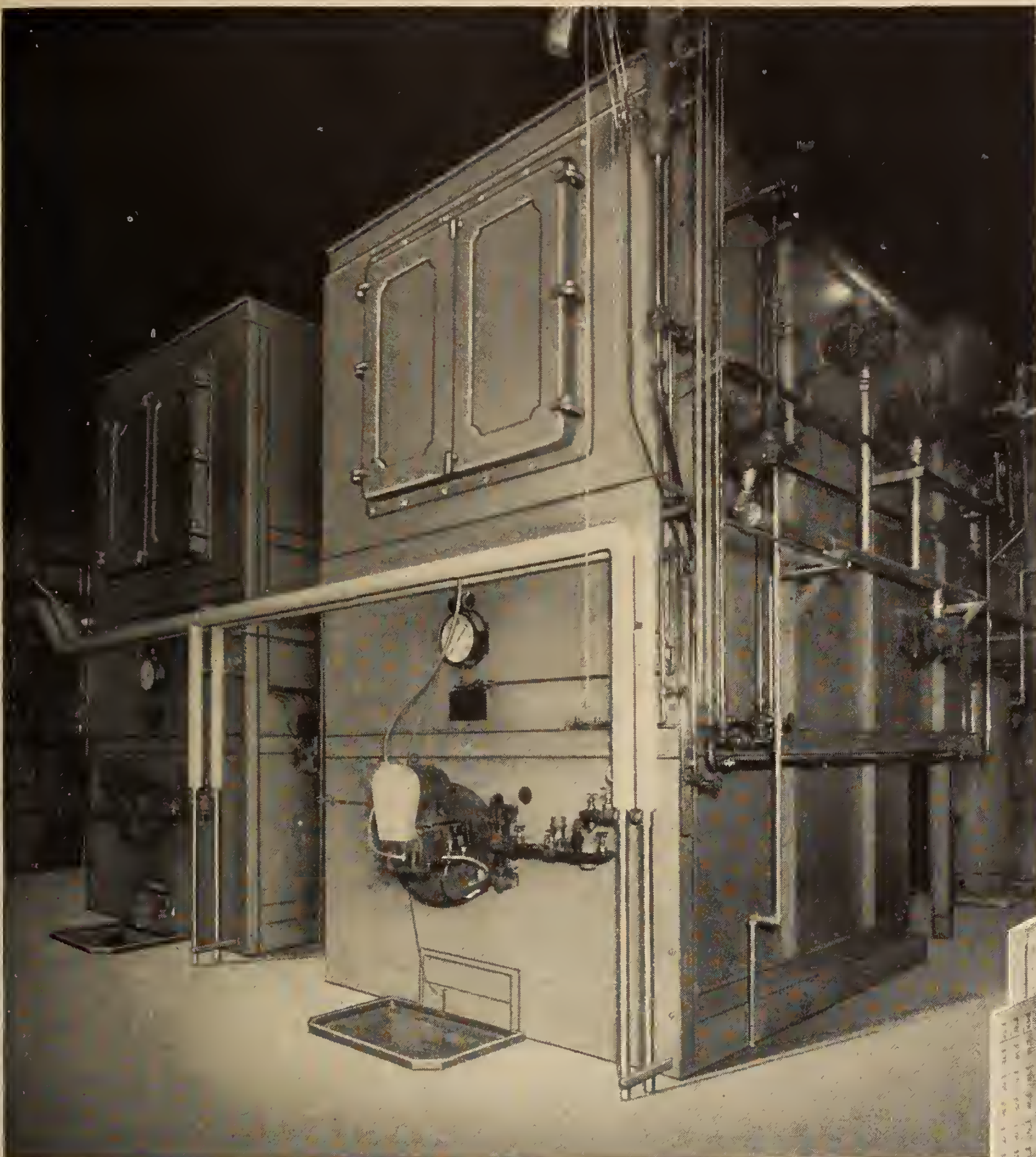
•

The Corrosion Section of the Applied Chemistry Branch of the National Research Council is conducting a field test to evaluate anti-freezes for automobile-cooling systems. Laboratory corrosion test specimens of steel, copper, aluminum and solder have been placed in the radiator systems of trucks.

•

Winnipeg is well-advanced on a two million dollar public works programme involving street improvements. The Town Planning Commission is considering possible construction of a bridge and locks at the Assiniboine River at Kennedy Street to provide an additional means of entrance to the downtown area.

(*Continued on page 525*)



Of the raw materials scarce during the War years, natural rubber has made the most remarkable return. Production in 1948 was a quarter more than in 1937, and the figures show a further increase for the first quarter of 1949 in Indonesia, although there has been a drop in Malaya. Consumption is now a third higher than the pre-war average and double that of the 1946-1947 period.

•

An International Joint Commission held meetings at St. Andrew's, New Brunswick, St. Stephen, New Brunswick and Eastport, Maine, August 18th to 23rd, for preliminary study of possible revival of the Passamaquoddy tidal power project. Sixty thousand dollars, supplied equally by Canada and the United States, will be used for preliminary study to ascertain the cost of a more detailed survey of feasibility and construction costs.

•

The City of Brantford and Suburban Planning Board has recommended the designation of an area northeast of the city, comprising nearly five hundred acres as a site for industrial purposes.

•

J. S. Aur Der Maur has reported that his Company, Saguenay Mining and Smelting Company will give the Dudley process for making steel its first commercial try out. Walter E. Dudley has been engaged for metallurgical consultation.

•

Two mining claims for asbestos on Sproat mountain B.C. have been optioned by the Acme Asbestos Company of Vancouver. Some tunneling has been undertaken.

•

A five million dollar diesel locomotive plant will be built near London, Ontario, by General Motors. Commitments have been made to buy parts in twenty adjacent manufacturing towns. Construction of the plant has been started and commencement of production is anticipated next spring. The operating Company will be known as General Motors Diesel Ltd. Operating at a capacity of one locomotive daily it will employ one thousand people.

•

Edmonton has top priority in the expansion plan of Canadian Westinghouse Co. Ltd. Immediate plans call for the erection of a two hundred and fifty thousand dollar warehouse and sales office similar to that recently completed in Calgary.

•

R. O. Sweezy has obtained approval from the Alberta Cabinet for the erection of a ten to twelve million dollar pulp and paper mill in the Edmonton area. He has also announced permission to use one thousand five hundred square miles of timber land to serve the mill.

•

The Canadian Cabinet has decided to continue the Canadian International Trade Fair for a third year.

•

F. A. Dowler, vice-president of Alberta Pulp Mills Ltd., has announced that construction will start in the fall of a nine million dollar pulp mill at Red Deer, Alberta.

The Company, which was incorporated a year ago, expects the mill to handle three hundred cords of wood daily.

•

In a note enclosed with dividend cheques, addressed to shareholders of the Company, H. G. Hilton, president of the Steel Co. of Canada Ltd. stated, in part, "Capacity production was maintained in all the major points of your Company throughout the first six months of this year and ingot production and sales, both in tonnage and value, reached new high levels for any six month period. A slight decline has occurred recently in the demand for some screw and wire products and for coke used as domestic fuel, but, with these minor exceptions, no reflection has been felt in Canada up to the present, of the general falling off in demand experienced by the steel industry in the United States."

•

The Canadian Wire & Cable Company has installed in its Leaside, Ontario, plant a new type of machine for fabricating aluminum conductor cable. The machine is 155 feet long and costs over one hundred thousand dollars. It is being used for the fabrication of cable for the Ontario Hydro Electric power expansion programme.

•

Dr. O. B. Hopkins, vice-president of Imperial Oil Limited, has intimated that the 470-mile Edmonton to Regina pipeline will be in operation in the fall of next year.

(*Continued on page 528*)

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

"Silicone Notes No. C-5" a publication of the Dow Corning Corporation, Midland, Michigan, gives the properties, performance and uses of the heat stable and oxidation resistant silicone lubricants. "Silicone Notes No. D-6" contains information on "How to Use DC 44 silicone grease in the bearings of electric motors". It includes instructions for lubricating open and single-shielded ball bearings and relubrication schedules. Copies of these and other publications dealing with lubrication may be obtained from the Company. Mention your firm, or position, when requesting copies.

•

International Rectifier Corporation, 6809 South Victoria Avenue, Los Angeles 43, California, has announced a new 6 page brochure dealing with selenium rectifiers. The booklet contains operating characteristics, applications, circuit diagrams and design data. Ask for publication C.349-848.

•

A new line of a-c and d-c measuring, indicating, signalling and recording instruments has been announced by Wheelco Instruments Company, 847 W. Harrison Street, Chicago 7, Illinois. These instruments are described in bulletin AC-1. Copies are available on request.

•

Caterpillar Tractor Co., Peoria 8, Illinois, have released a new 16 page brochure "Slope Stake to Final Grade". The publication describes the completion of a road building job by means of caterpillar equipment. Copies may be obtained on application.

•

Spielman Agencies Ltd., 420 Lagauchetiere St. West, Montreal 1, offers descriptive literature on "Valdura" Improved Asphalt Paint.

•

To those interested in management problems "A Financial Report to Dominion Bridge Company Employees" is recommended. This report covers the year ended October 31st, 1948 and it has been prepared to give the employees information on the Company's financial operations. It is well illustrated, simply written, and printed by means of photo-offset. Copies can be obtained from the sales promotion manager of the Company at Lachine, Quebec.

•

Aircraft Marine Products Inc., 1523 N. Fourth St., Harrisburg, Pa., have produced a unique folder describing A.M.P. Solderless Terminals. The brochure has been prepared with actual samples of products enclosed, and information is given as to how further technical and application data may be obtained. Copies are available on request.

•

Wheelco Instruments Company, Harrison Street, Chicago 7, Illinois offers *Journal* readers copies of bulletin P1-1, "Wheelco Cabinet Type Instrument Panels".

•

Automatic Electric (Canada) Limited, 284 King Street West, Toronto 1, has prepared a handsome twenty-eight page brochure to celebrate sixty years of service to the Canadian electrical and communication industries. The publication describes highlights in the manufacture of wires, cables, and telephone equipment in the Brockville and Montreal factories of the Company's associate manufacturing concern, Phillips Electrical Works Limited. The publication is highly informative and very pleasing in appearance. Copies will be sent on request to *Journal* readers.

•

The importance of soil mechanics in railroad engineering is stressed, modern methods of treating railroad tracks are described, and recent improvements in the art of grouting and repairing concrete and masonry work are fully covered in a newly published book entitled "Modern Railroad Structures", by C. P. Disney and Robert F. Legget, director of National Research Council's Division of Building Research.

Copies may be obtained through application to the National Research Council, Ottawa.

•

The Canadian General Electric Co. Ltd., 212 King Street W., Toronto 1, has released a bulletin in which are described lectures which can be made available by the Company for presentation at meetings. The lectures are provided without charge, and usually the use of film slides is provided. Included in the diversified subjects are the latest electrical developments in research, central stations, industry, etc. The bulletin also describes the Company's film-slides which are available on loan or permanent loan basis. Address your enquiries to the Company and ask for bulletin 4289G.

•

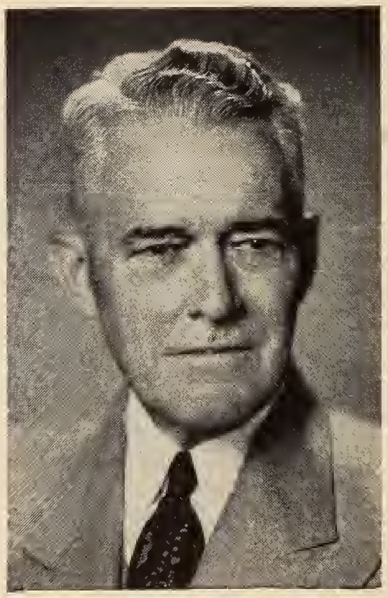
Joseph Booth & Bros., Leeds, England, offer a folder-type publication in which is described the lifting equipment manufactured by the Company.

Appointments and Transfers

John W. MacLea has rejoined Canadian Line Materials Limited, as a sales engineer. He will make his headquarters at the Company's Toronto office.

•

Watson P. Hall has been appointed to the Ontario sales office of the American Wheelabrator & Equipment Corp. For the past three years he has been a member of the service engineering staff of the Company.



W. O. Bovard

W. O. Bovard, formerly vice-president of sales, has been elected director, and vice-president and director of sales of Canada Cement Company Limited.

The general offices of Canadian Allis-Chalmers Co. Ltd., have been moved from Toronto to Lachine, Que. The new address is 125 St. Joseph Street, Lachine, Que. All divisions of the Company formerly located at 212 King Street West, Toronto, have been moved to the new location.

Sales and Service offices are maintained by the Company as follows:

Montreal, 630 Dorchester Street; Toronto, 629 Adelaide Street; Winnipeg, 707 Lindsay Building, Notre Dame Avenue West; Calgary, 805 Greyhound Building, 7th Avenue and First Street; Vancouver, 1202 West Pender Street.

•

G. R. Burrow has been appointed sales manager for the Montreal District of the Steel Company of Canada Limited. Mr. Burrow joined the Company in 1940 after graduating from McMaster University with a degree of bachelor of arts in economics.

•

David Boyd has been appointed manager of manufacturing of the English Electric Company of Canada Limited. He will be located in the Company's plant at St. Catharines, Ontario. Mr. Boyd was formerly works manager of the general engineering division of the John Inglis Co. Ltd., Toronto. He is a graduate of McGill and was awarded the Institute's Gzowski medal in 1936.

•

J. T. Asquith has been appointed vice-president and general manager of Canadian Car and Foundry Co. Ltd. He succeeds Lyle McCoy who has retired on pension.

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CONTENTS

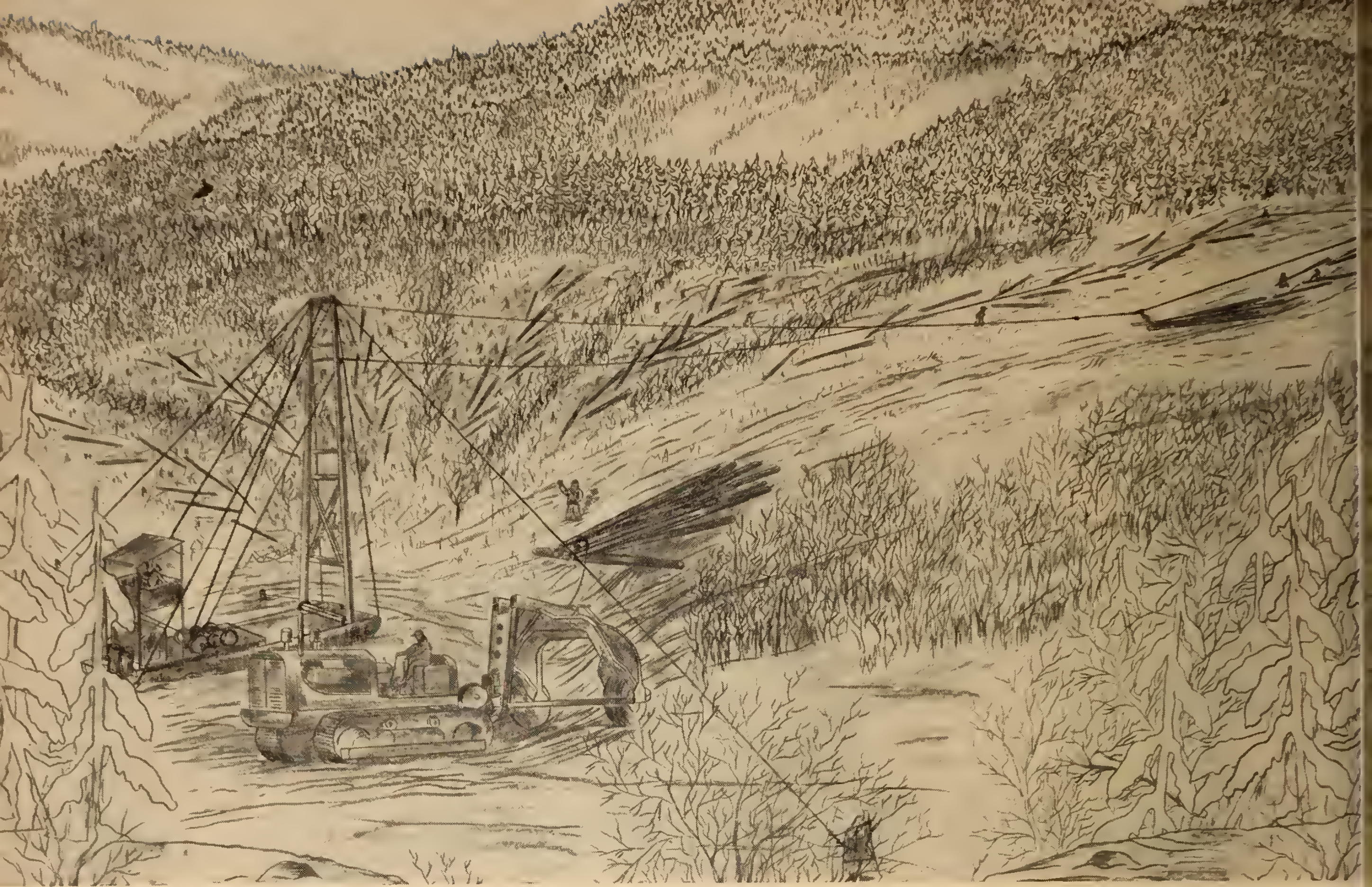
12,400 copies of this issue printed

COVER PICTURE

In this issue, Ernest Gohier, M.E.I.C., chief engineer of the Quebec Department of Highways, describes the construction of the highway which links Quebec City, through the magnificent Laurentides National Park, and the Saguenay-Lake St. John area.

The cover picture shows a section of the road being finish graded in preparation for final surfacing.

Photo courtesy Caterpillar Tractor Co.



Mechanization Of Pulpwood Logging Operations In Eastern Canada

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada on May 11-14, 1949, at Quebec City.

by
J. O'Halloran, M.E.I.C.,
Chief Engineer,
Anglo-Canadian Pulp and Paper Mills Limited, Quebec, Que.

This subject is one which has received close attention from the pulp and paper industry in recent years. It will undoubtedly play an increasingly important role in the future harvesting of pulpwood. The word "mechanization" is purposely used, rather than the term "mechanical logging." The purpose is not to limit the discussion solely to the problems involved in moving pulpwood from the stump to the main artery, river, or railroad. Those have been the chief points covered by many so-called "mechanical logging" articles published over the past few years.

Probably the main reason that few serious efforts were made to mechanize pulpwood operations prior to World War II was that there was the lack of necessity for doing so till that time. In addition, many of the problems seemed almost insurmountable when handling the relatively small trees of our eastern Canadian forests by mechanical means. As an indication that the job is not easy, many experienced operators have expressed the opinion that mechanizing our eastern pulpwood logging would be "like trying to pick up pins while wearing boxing gloves." Be that as it may, it not only can be done,

Fig. 2. (Above) Diagrammatic layout of high lead yarding.

Outlining the influences that have brought about today's widespread mechanization of logging operations, the author enumerates the benefits that may be derived from it. Each operation is taken in turn, showing the progress made by the Anglo-Canadian Pulp and Paper Mills Limited in mechanization.

The Modified Western High Lead Yarding System is discussed, detailing the operations of felling, decking, hauling, sawing into bolts, fluming and loading. A gravity loading plant is described, as well as types of cargo boats used. Brief mention is made of mechanization as applied to auxiliary services. In conclusion the author points to the opportunities open to young engineers in pulpwood logging, and advocates special logging engineering courses in university curricula.

but *is* being done today on a varying scale by several companies.

Mechanization, as here used, refers to equipment of any kind, whether moving or stationary, which either reduces the personnel necessary in logging operations or makes it easier for the present personnel to produce the desired results. Keeping this in mind, we might look back to the late "thirties", when some of the pulp and paper companies began to realize the possible advantages of handling pulpwood in larger units such as tree lengths. For many years before that time eastern pulpwood operators had been running tractor sleigh hauls and truck hauls. Due chiefly to lack of suitable equipment, no serious attempt had been made, however, to develop any modified western scheme for handling full length trees. With the coming of greatly improved tractors and winches about this time, interest in the subject was revived. Some preliminary experimental work was started by certain operators, such as Anglo-Canadian Pulp and Paper Mills Ltd. After 1939, however, there was little opportunity to continue the work, and practically no progress was made during the war years. Since that time there has been renewed interest in the subject by many who visualize great advantages in mechanization if it can be carried out successfully.

Probable Benefits Accompanying Mechanization

All of the following objectives show promise of being at least partially attained by mechanizing, and the fulfilment of them is coming continually closer;

a) A reduction in the heavy manual effort involved in cutting, piling, and loading 4-foot pulpwood.

b) An increase in the cords produced per man per day.

c) An increase in the number of machine operating jobs, calling for more highly trained, and hence better paid personnel than formerly.

d) A higher standard of living in the woods, as a result of the increased number of better trained and better educated personnel.

e) A longer operating season in the woods, with a consequently closer approach to year-round employment, and a more stabilized crew whose families would live near the logging operations.

f) A more rapid delivery of pulpwood from stump to mill, with consequent reduction in storage piles, and less capital tied up in high inventories.

g) An overall reduction in cost of harvesting pulpwood.

The coming of the war in 1939 brought home very forcibly to all pulpwood operators how dependent they were on manpower. As the war developed, it became increasingly difficult to hire men to work in the woods, and many pulpwood operations had to be greatly curtailed. Such men as were available found more desirable jobs in war plants or elsewhere at higher wages. Doubtless this period had much to do with focusing the attention of executives on their woods operations. It became apparent that woods operations would have to be rapidly improved, if men were to be employed who would continue to work there. To bring about this improvement, the management of many of our leading companies decided the time had arrived to apply the same sort of intensive study to all aspects of our logging operations as had been common practice in the mills for years.

Rising Cost of Pulpwood

The effect of shortage of men and supplies, combined with the rising cost of supplies and labour rates during the war, all tended to increase the cost of pulpwood. Since the war, these items have con-

Fig. 1. Typical mechanical logging camp layout.

Fig. 3. Hauling unit.

tinued to rise to an all-time high, so that wood is now in most cases the largest single item of cost in the manufacture of paper. It is not surprising, therefore, that the industry in general is greatly interested in lowering its wood cost, and in seeing what savings, if any, can be effected through mechanization. To give some idea of how wages have increased in the woods in recent years, the following figures are quoted with the permission of Mr. W. A. E. Pepler, manager of the Woodlands Section of the Canadian Pulp and Paper Association. The average weekly earnings, at the end of March, of loggers east of the Rockies in 1946 were $26.88; in 1947 they were $35.00; and in 1948 $39.83. These are increases of 48 per cent since 1946, and 14 per cent since 1947. As 90 per cent of the pulpwood harvested is east of the Rockies, and totalled 7.7 million cords in the past season, some idea can be formed of the importance of this to the industry.

Not only have the wages in the woods increased greatly, but it has also become very difficult to find experienced woodsmen to keep pace with the increasing quantities of pulpwood which are being used. With the present high level of industrial employment there are more jobs available in the city than formerly. Many men, experienced in the logging business before the war, have therefore found other lines of work. Most of the pulp and paper companies are trying to operate classes for instructing men in the felling and sawing of wood but this is a big undertaking when one considers the number of men involved. In consequence, the average logger is not as productive today as in the prewar years. Not only are we paying higher wages than ever before, but we are also getting less production per man, so that both factors combine to make pulpwood very costly. Any mechanization schemes which show promise of making more efficient and economical use of manpower in the woods are, therefore, much in demand.

What Can We Mechanize?

Before any decision is made to partially or completely mechanize any operations, careful and accurate cost figures must be obtained on each one of them. This is difficult for operations, where work may be going on at 30 or 40 different camps, each with different conditions of wood, terrain, and personnel. Each of these factors will vary considerably depending on conditions. Careful study must be given to any proposal to substitute mechanical equipment. As a start, only those operations should be chosen where mechanizing appears to have the best chance of saving and reducing manpower.

Having reached the conclusion that we should consider mechanizing, we must examine the details of a logging operation to see how far it appears possible to economically mechanize each operation at the present time, and with the equipment now available.

Any equipment which reduces labour or makes it easier to do a job, may be considered as mechanization.

Cruising, surveying, mapping, and working plans.

These operations can now be done largely by the use of aerial photographs, which have revolutionized the survey of timber limits, as well as the estimating of wood quantities. Air photos are also useful in choosing camp and road locations. Excellent relief maps may be prepared from them for any particular areas, at reasonable cost. The final detailed large scale maps required for actual cutting operations must of course be made up from a ground survey, though the work of preparing them can be simplified by constant reference to the photographs. Aircraft have become a tremendous help for this purpose in operating a logging operation. They are also invaluable for transporting ground survey parties to isolated parts of the limits for examining any spots in detail. The application of aircraft to surveying and mapping is an excellent example of almost complete transition from a long, costly, and often inaccurate process, to a quick, easy, accurate, and relatively cheap one, by employing the proper equipment.

Building of roads.

This is a suitable item to mechanize as completely as possible. No better example exists of the wonders which can be worked with mechanical equipment than the present day method of building roads. Timber limits formerly considered inaccessible are now easily reached, due to the speed and economy with which high class roads can be built. Mechanization of roadbuilding with all of the equipment specially developed for that purpose is so completely established now that no one would contemplate doing it otherwise.

Erecting camps, sheds, etc., close to cutting areas.

Here we find a direct tie-in with the high class roads which can be built at reasonable cost. The main roads into a logging operation are usually quite good enough for a large truck pulling a low bed trailer. Portable logging camps can be transported with ease from one site to another, and that is the practice we now follow. On the Anglo-Canadian limits at Forestville strong, well built, insulated camps, each 16 ft. by 30 ft. are transported from place to place as required. Many of these camps have been moved a dozen times with an average of 5 miles per move and are still in perfect condition. The camps are built on heavy skids, permitting them to be moved without the use of a low bed trailer on short moves, over roads iced or covered with light snow to give a low coefficient of friction.

While one would not ordinarily consider portable camps as mechanical equipment, they are the beneficial outcome of mechanizing an operation and should be mentioned. Portable camps (Fig. 1) can be used almost indefinitely, saving considerable good wood which formerly went into the construction of logging camps. There is also a tremendous saving in labour formerly required for erecting them at each new site. Portable camps are a definite step forward and tend to raise the whole standard of living in the woods.

Transportation of men and supplies.

The advent of high class woods roads has revolutionized the moving of men and supplies to the camps. Where we formerly had to use trucks or wagons for transporting personnel, we now use standard motor buses, which in most cases make two trips each way daily. For handling supplies, it is now possible to use any type of truck that travels the highway. The excellence of the present transportation system is playing an important part in improving living conditions in the woods.

Felling, limbing and sawing the trees into logs.

These are all items which are in a more experimental and development stage than those so far mentioned. There are many different schools of thought as to the best way of doing these operations mechanically. Probably the reason is that conditions vary so widely from place to place. Several companies now use chain saws economically for the three steps in this operation where the type of wood and terrain are suitable. Due to the kind of terrain on the limits back of Forestville we prefer to fell and limb the wood by hand on the mechanical logging sections of our operations, and leave it lying in tree lengths for skidding out by cable. No mechanized system has become standard practice for these operations to date, although much development work is being done. This item can be partially mechanized economically at present, depending upon conditions.

Piling the bolts ready for scaling.

This item of course applies only to an operation where the wood is cut either by hand or with chain saws into 4-ft. lengths. As far as the writer knows, no equipment is available for picking up sticks of wood individually and at random and piling them. Mechanization of such an operation seems a long way off at the present time. The system of handling pulpwood in tree lengths eliminates this operation completely.

Loading on sleighs or skids.

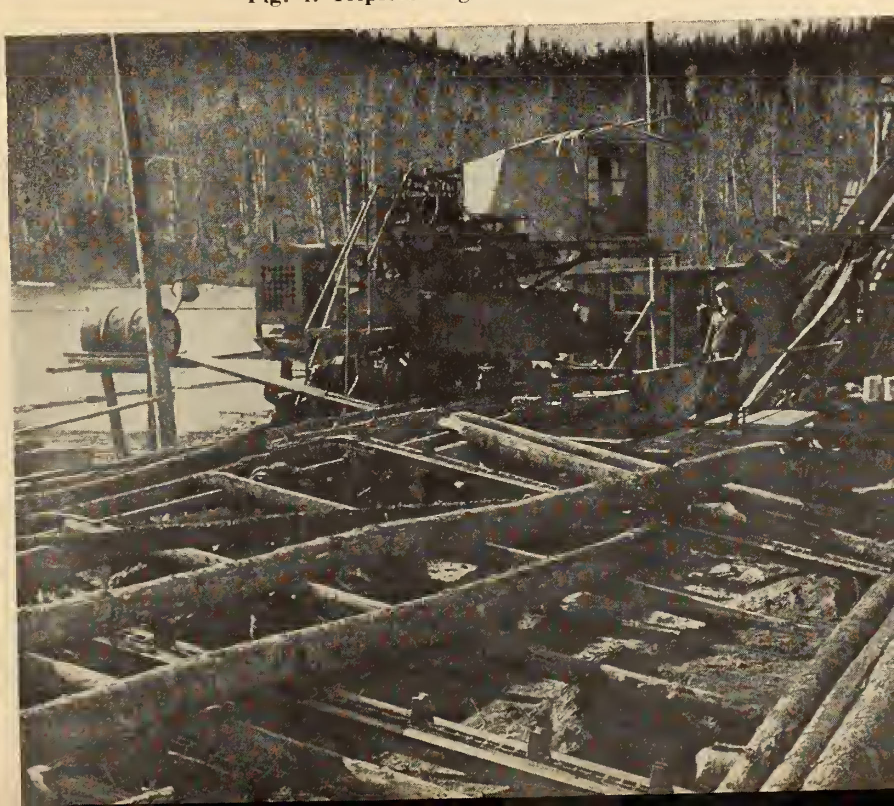
This applies only to operations where the wood is cut by hand or chain saws into 4-ft. lengths. There is a piece of equipment in the form of an attachment for a tractor, capable of picking up bundles of wood and loading them on a sleigh or truck. However, it appears to be best suited to working along the side of a main road or level clearing. It is doubtful whether it would be economical to use it for gathering up small piles of pulpwood located at random in the woods. The writer is not aware of any place where these small piles of wood are being loaded mechanically. In tree length handling of pulpwood, this heavy manual labour is of course eliminated.

Driving the streams and towing in the lakes.

This operation takes place after the ice breaks up in the spring, so that the wood may be water borne to a concentrating pond or "holding ground" as it is usually called. In considering schemes for mechanizing this phase of the operation we must also include the fluming of wood. In many operations, by careful study and engineering work, there have been some splendid flumes built which have carried wood economically for many years. This method of handling wood, while not normally considered as mechanization, is rightly so. It is one of the soundest methods of transportation from every point of view. Where the volume of wood to be handled justifies the large capital expenditure, it should certainly be adopted.

The use of trucks in many cases is working out economically in place of attempting to drive small streams or lakes. Accurate data may be obtained on a wide range of these vehicles, so that one can figure out quite closely the saving, if any, that would be effected in using them. The possibility of replacing the usual system of driving of streams by some cheaper and mechanized method should in every case be closely examined. These cases will be found to vary greatly, and no general statement can be made as to how far mechanization of this operation can be carried.

Fig. 4. Triple swing cut-off saw.



Loading, transportation, and unloading.

These operations, which include unloading pulpwood from the "holding ground" in the woods to the conveyor in the mill yard, vary widely through the industry. In many cases they are already highly mechanized by the use of such equipment as special jackladders, flumes, ships, cranes, etc. This is undoubtedly one division of a logging operation where mechanization can be thoroughly applied at present, and where the saving in manpower can be impressive.

Modified Western High Lead Yarding System

The matter of moving tree lengths of pulpwood easily and economically from the stump, to a neat pile or "deck" by the side of a hauling road, is one of the most complex problems which we encounter in attempting to mechanize a logging operation. Unfortunately there are many variables, and in some cases they all change at the same time. Rarely, if ever, do you find two adjacent set-ups where conditions are exactly the same. Some of these conditions are as follows: diameter of trees, and hence trees per cord; trees per acre, and hence cords per acre; type of terrain; type of soil and moisture conditions; depth and condition of snow; temperature and humidity of atmosphere; percentage of birch and weed species trees per acre; percentage of windfalls; and prevalence of insects during summer operations. It can be seen from this list that an almost infinite number of combinations of conditions can be encountered.

On the Anglo-Canadian timber limit above Forestville on the watersheds of the Sault-au-Cochon and Laval Rivers, the terrain is rough. For this reason, we decided to experiment with a modified form of the simplest type of western "yarding" system which we could devise. The term "yarding" is used in the West to describe the moving by cable of trees or logs from the stump to a pile or "deck". This form of "yarding" is a simple version of the "high lead system". This is fundamentally a drag line, and it consists essentially of a two or three drum winch, and a niggerhead or gypsy spool which operates independently from the drums. Also, either a gin pole, A-frame, or boom, is used, to support the sheaves high above the winch, which lead the cables to the winch. Two or more tail blocks are also located back in the woods, around which the haul-back cable operates.

We are operating many different types of winches such as double-drum units on different makes of tractors, a specially built experimental mobile unit with self-contained boom, and several makes of logging winches mounted on heavy skids carrying A-frames. From experience over four years with these various machines, we are inclined to favour the latter type at present. (Fig. 2).

Fig. 5. Dump trucks discharging into centre of river.

Felling

Before explaining the action of the winch and cable, it would be helpful to outline the way in which the wood is felled. We attempt as far as possible to adopt rectangular areas, either 300 ft. by 600 ft. or 400 ft. by 800 ft. From the center point midway along one of the longer sides, the wood is "clear cut", or 100 per cent cut in a semicircle with a radius of 60 ft. A triangular shaped area is bulldozed to roughly level it, so the winch or "decking unit" as we call it, can manoeuvre properly. Strips 8 ft. wide are "swamped" or cleared, and stumps of minimum height are left in these lanes. All trees are felled herringbone fashion, with their tops pointing in towards and lying about 2 ft. across the centre line of the strip. In this felling, it is important to have the stumps as low above the ground level as possible. When all of the felling is completed, the moving of the "decking unit" is accomplished by means of a medium weight track type tractor, hauling the winch and its A-frame into position. The A-frame, or mast, is held in a permanently vertical position by four guy wires attached to ends of the heavy skids, which support the platform which carries the winch. The tractor leaves the winch in such a position that the longitudinal axis of the platform is at right angles to the 800-ft. side of the area to be logged. The vertical axis of the mast also coincides with the centre of the fan shaped pattern which has been laid out. Without moving from this position, the winch is able to haul in wood from the strip immediately in front of it which is 400 ft. long. This then, leaves a clear path for the tractor with bulldozer to proceed across the area and to prepare the hauling road for the next area to be logged.

The "decking unit" also hauls the wood off each strip to the right and left of the future hauling road while in its present position. After removing wood from these strips, the winch swings the "decking unit" around with its own moving line so that it makes an angle of 45 deg. with the hauling road on the left side. Wood remaining in the left half of the rectangular area is then hauled out without further movement of the winch platform. When the left half is completed, the winch swings the unit around so the right half of the area can be logged.

Piling or " Decking "

A 20-ft. length of ¾-in. cable joins the main part of the " haul-in " cable to the " haul-back " cable. Over this ¾-in. cable, five standard shackles are fitted and to each a 5-ft. length of 7/16-in. cable is attached by means of a spliced eye. These short slings or " chokers " as they are called, may therefore slide on the cable for a distance of roughly 19 feet. On the free end of each a hook is located, which allows the " choker " to be passed through it to form a loop. It is therefore possible to move the " chokers " back and forth along the center line of a strip, on which trees are already felled in herringbone fashion. Starting next to the A-frame, each of the " chokers " is fastened around the top of a tree length and about 2 ft. from the end. The fact that the " chokers " can move independently for a length of 19 feet allows considerable flexibility in reaching the ends of the logs with them.

When the " chokers " are fastened, a signal is given by the foreman to operate the " haul-in " drum, and slacken the " haul-back " drum. When the load has been dragged in, it is lowered down on a 30-ft. length of 1-in. cable lying at right angles across the strip. It is used as a sling to pass around the " deck " or pile of wood after it has been hauled in from the strip. The process of moving the " chokers " back and forth on the strip and bringing them in as fully loaded as possible, is repeated until all of the wood has been piled. On an average strip, approximately 7 cords of wood are removed. If it runs much higher than this, the excess quantity is piled on a second sling alongside of the first.

Hauling a Load of " Tree Lengths "

As " decking " is proceeding, a " hauling unit " (Fig. 3) or large track type tractor, towing a specially designed " sulky " approaches the decking unit and backs the sulky up to the pile of wood which has been built up. When the load has reached a suitable size, about 7 cords, the cable sling under the pile is hooked together to

Fig. 6. Loading plant and converted L.S.T. vessel.

form a loop around it. The winch cinches up the loop around the load of wood and hauls the whole load in under the arch of the sulky, holding it suspended in mid-air. The tractor then moves ahead with the load dragging on the ground.

As the butt ends of the trees are dragging the tractive effort required is high, and the tractor must often travel in low gear, at least in starting. Ground surface conditions, and thus friction, vary greatly. In addition, short sharp adverse grades are often encountered which means that the " hauling unit " must always have excess power. We try to limit the length of haul from a decking unit to the saw to 1½ miles, as anything beyond that distance involves too much time per trip. It also causes too rapid wear of the tracks and travelling mechanism of the tractors.

Special Cut-off Saws for Tree Lengths

Two systems of sawing are used at Forestville at present. One of these is as follows. In order to buck or saw tree lengths of wood into 4-ft. bolts quickly and economically, it was necessary to design special saws. Three separate units have been built, one with two swing saws, one with three swing saws, and one with three slide saws. Each unit uses circular saws with removable teeth. The daily 10-hour capacities for these units are respectively, 90 cords, 220 cords, and 350 cords. Having sawing units of different outputs enables us to allocate one of the proper capacity to handle a specific number of decking units.

Each sawing unit has a set of feed chains and rollers preceding it so that tree lengths may be easily fed to it. A bundle of wood is dropped close to the feed chains by the sulky and the sling is undone. As the tractor and sulky advance, the sling is pulled free of the bundle and the tree lengths tend to spread out. They may easily be rolled from this position on to the chains feeding the saw. The feed chains of the sawing unit carry the logs up a slight incline until they roll over the head sprockets and land on a series of live rolls. These move them lengthwise towards a butting plate located 4 ft. past the farthest saw. When approximately three trees of average size have travelled the maximum distance, the No. 1 saw, nearest the butting plate is swung down and cuts off 3 lengths of 4 ft. each. Similarly the second and third saws swing down in turn so that an average result of 3 saw cuts is 9 bolts of wood. The portion of the saw table supporting the bolts then tilts up to an angle of about 30 deg. to the horizontal and the bolts roll off it on to a chain conveyor. When the table drops back to its original position, the live rolls are again operated to bring a fresh load of logs into position for the saws. All of these mechanical motions are controlled by one operator, who manipulates a series of banked hydraulic valves controlling the flow of oil to cylinders which in turn operate clutches, etc., on the different components. (Fig. 4.)

The conveyor which receives the wood from the sawing unit is a standard type of 2-chain design. It may elevate wood to a storage pile or block pile, or it may be arranged to carry wood up an incline so it falls loose into trucks with box type bodies. (Fig. 5) The location of sawing units with respect to the main road, drivable streams or lakes varies considerably, and is the feature which determines the most economical means of transporting the sawn wood.

Chain Saws for Cutting Tree Lengths into Bolts

One of the obvious disadvantages of having large centralized sawing units, such as the power operated swing saws or triple slide saws, is that some of the hauling units must travel considerable distances, requiring larger numbers of units. To bring more flexibility to the sawing operation, we have gradually been changing over to the use of portable type chain saws. At the junction of a hauling road with the main road, a landing is prepared on which the load from the sulky may be deposited. Here the tree lengths may be rolled on to bunks by the use of peaveys, and the trees cut into 4-ft. bolts with chain saws. The wood from the saws is loaded by hand on trucks which operate on a road 4 ft. lower than the level of the bunks. Some of the manual effort required in loading wood obviously still remains, and the operation is thus only partially mechanized.

The above operations illustrate simply a system by which the required results in felling, hauling, and sawing, may be accomplished. Many different ideas are being tried today by other organizations, and our systems are not by any means the ultimate in this line. We are constantly gaining experience on the subject which serves as a guide to improve and change the equipment from time to time.

Fluming and Loading of Pulpwood

Before our pulpwood logging operation was started at Forestville, The Sault-au-Cochon River terminated in a waterfall close to the St. Lawrence River, dropping about 73 feet to low tide level. We constructed a timber and concrete dam here which raised the water level about 8 feet. We then blasted out two channels on the east side of the falls. One of these was turned into a diversion canal and fitted with stop-logs for controlling the level of water above the dam. The other was lined with a concrete channel to form the entrance to a flume for carrying pulpwood.

The entrance to this flume was equipped recently with an adjustable type of submerged weir inlet which has proved beneficial in guiding the wood into it. The first 240 ft. of the flume is trapezoidal in section, and carries twice the amount of water that flows in the main part of it, which is a V-section lined with light sheet steel plate. At the point where the section changes from rectangular to V-shape, there are a series of gratings located in the sides of the flume. Here excess water required in the first section of the flume is wasted. The total length of the flume from dam to loading plant is 6,000 ft. and a block of wood takes about 10 minutes to travel this distance.

Gravity Type Loading Plant

The loading plant on the Forestville wharf is similar to several other installations on the north shore of the St. Lawrence except that the chutes are of all steel construction. They also have somewhat more flexibility both vertically and horizontally than is usually found. (Fig.6) The function of the loading plant is to deliver wood in a dewatered condition, into the hatches of a vessel alongside of the wharf on which the flume is supported. There are 8 gates or doors on the east side of the flume which may be rapidly opened and closed. The gates are operated one at a time, and deflect water and wood from the flume so that they then flow over a grating made of flat bars on edge. The wood continues to slide down to a flexible chute which guides it into the ship.

Bulk Cargo Boats

By manipulating the outboard end of the chute vertically and horizontally, considerable control can be maintained over the trajectory and direction of wood leaving it. To operate to best advantage with this type of loading, a bulk cargo boat is the most suitable design. Before the 1948 season, we used the conventional type of "lakeboat", but last year we handled all of our wood with two ships which we converted for this particular operation. Unloading of the ships at Quebec is carried out by the use of wood grapples and four conventional type swinging cranes mounted on the wharf.

Early in 1947, we purchased two American L.S.T. vessels and had these converted at Halifax for handling pulpwood. These two ships were entirely satisfactory last summer, and handled 141,000 cords in 132 trips, or 1,070 cords per trip. Further conversion work is being carried out which will slightly increase their capacity and considerably reduce the loading time.

Auxiliary Services

Before logging operations can be commenced on any timber limit, it is necessary to obtain a vast fund of information regarding the quality and quantity of wood available, type of terrain, accessibility of the wood, etc. A definite working plan must therefore be laid out by a department specially set up for that purpose. Some of these auxiliary services will now be mentioned.

Forestry, Logging Engineering, Fire Protection, Planning and Layout.

The important duties of this department, under the supervision of the chief forester, are the collection, compilation and presentation of all data pertaining to the wood supply, as well as the preparation of estimates for improvements on lakes and streams, such as dams, retaining walls, etc. Supervision of all arrangements for fire protection is also one of the duties of this department. In this connection we are making increasing use of aircraft for locating fires and transporting men to combat them.

Road Construction and Maintenance Dept.

We have found it advantageous to operate our own Roads Dept., as a section of the Woods Department. This department is responsible for building and maintaining all of the main roads on our limits which now total 82 miles. Roughly half of this is kept open all winter. The quality of our main road is equal to any first class gravel highway, with overall width of driving surface of 30 feet, crown 4 to 6 inches, and ditches 2 feet wide at the bottom, with 1½ to 1 slopes.

Maintenance and Mechanical Dept.

The operation of this roads department, as well as the operation of about 15 "yarding" or "decking" units, requires a large quantity of mechanical equipment. As this is usually in severe service, maintenance of it is a major problem. One of the greatest factors with mechanical equipment in a logging operation is the successful carrying out of preventive and routine maintenance as well as emergency repairs. Complete repair shops must be provided at the base of operations, which in our case is Forestville. Besides this, field repair shops must be maintained in the woods near the operations, where emergency repairs and preventive maintenance can be carried out.

To give some idea of the diversity of the work done by this department, a list of the type of equipment handled would include: tractors of all sizes and several makes, stationary diesel and gasoline engines, trucks of many sizes and makes, snowmobiles of several sizes, snow plows and snow blowers, outboard motors and portable fire pumps, road building equipment of all kinds, such as graders, scrapers, etc., mobile cranes and shovels, automobiles and jeeps, and winches of several makes and sizes. Large quantities of spare parts must be kept on hand to service all of this machinery, and the handling of this phase of the work is extremely important. A well equipped machine shop is also operated in conjunction with the repair shop, which is capable of turning out emergency parts for machines in many cases.

It will be seen from the foregoing that there is a large investment in mechanical equipment in any woods operation today, particularly so when much of the actual logging is done mechanically. A high degree of co-operation is essential between the operators of this equipment and the men who are maintaining it. It has a tremendous bearing on the continuity of service from the machines, which is immediately reflected in overall logging costs as well as maintenance. It should be apparent from the foregoing, that a completely modern conception of the use of mechanical equipment must be followed if a pulpwood logging operation is to be successfully mechanized.

Opportunities for Young Engineers

The chief reason for mentioning the wide range of mechanical equipment, and various types of operations carried on in connection with pulpwood logging, is to try to interest young engineers in the opportunities in this line of business. There does not appear to be any better opportunity for the application of ingenuity and engineering knowledge. Engineers are taught the proper method of approach towards solving problems of the type which arise in connection with logging operations. It is logical therefore to employ them, although they may not have had any previous logging experience. It is not suggested that young graduates should immediately be given positions of major importance, but there are many minor jobs which they could fill while gaining experience.

In all pulpwood logging operations these days, mechanical or otherwise, there is a vast array of mechanical equipment used. The intelligent application of this equipment to the problems which arise is engineering, and should best be carried out by men trained in that profession. This is not to imply that the only engineering problems are in connection with the use of mechanical equipment. There are at least as many or more in connection with such projects as dams, bridges, flumes, booms, roads, etc. These are more in the line of civil engineering, but serve to indicate the diversity of the work in this branch of the industry. On account of the great volume of work involved in the solution of all of these problems, it is the writer's opinion that a large number of young engineers could be employed in the pulpwood logging business to good advantage.

The question will undoubtedly be raised as to what type of engineer is best suited for the present kind of work in the woods. With the university courses organized as they are today, graduates in forestry, mechanical, or civil engineering can all find useful employment. However, since pulp and paper is now the largest single industry in Canada, and the wood supply is of tremendous importance, it would seem reasonable that there should be a special course started in logging engineering. This could combine forestry, mechanical, and civil engineering in the proper proportions to provide an engineer who could be applied to best advantage in the woods. We have as an example, a mining engineering course, which is designed for the purpose of giving specific training to men wishing to follow this line of work. If a special logging engineering course were given, graduates would have a good basic knowledge of the type of problems which would confront them, and the net result should be very beneficial to the logging industry generally.

Conclusion

Mechanization of pulpwood logging is progressing and will undoubtedly reach a much higher degree of development. The speed with which improvements in technique and equipment will take place will depend mainly on the degree to which ingenuity and engineering principles are applied to the many and complex problems involved. As mechanization expands, a corresponding improvement in working conditions in the woods will follow. This will in turn have a stabilizing effect on the lives of a large number of men who are employed in this business.

The application of mechanization to pulpwood logging presents many opportunities for young engineers. It is hoped, therefore, they will show sufficient interest to enter this field of endeavour, and thereby help to speed up the coming of improvements which are waiting to be developed.

THE QUEBEC—SAGUENAY—LAKE ST. JOHN HIGHWAY

by

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A paper presented before the Annual General and Professional Meeting of The Engineering Institute of Canada, May 11 to 14, 1949, at Quebec City

Explaining the need for a modern highway to serve the Lake St. John and Saguenay districts, the author discusses the choice of a location and outlines the standards and specifications to which it is being built. Describing the method of procedure in awarding of contracts, and the choice of which sections should be done first, progress to date is recorded and the advantages accruing to the Saguenay valley through its completion are listed.

Most of you have probably learned, from the radio or the press, that the Province of Quebec is building a highway, improperly called the "Chicoutimi Highway". People have discussed it widely during the past two years and, mind you, praise has been accorded neither to the policy of the minister of roads nor to the work of the engineers responsible for the plans, specifications and the supervision of its construction.

This new highway, the largest road construction job yet undertaken by our Department since its inception some 40 years ago, is the one which has been the most criticized during its construction. Yet today it is the one that is receiving the greatest praise from its users, and remember that only some 70 miles out of its total length of 200 miles are substantially completed, though it is opened to traffic over its entire length.

Though good roads have always proved indispensable to the economy and to the social and cultural well-being of every prosperous nation, you will probably be amazed to hear that the Saguenay and Lake St. John Districts of Quebec have been for ninety years without any access by road to the outside world, which means that they were really land-locked. Actually, only since 1928 have these two districts been linked with the City of Quebec by three roads of a secondary type. Prior to that time, their populations could reach Quebec City only by boat during the summer months, or since 1885 by rail the whole year round.

Notwithstanding the fact that the distance from Quebec City to these districts is only about 125 miles as the crow flies, the three roads leading to them were from 156 to 206 miles in length. These roads were of a primitive type, narrow and winding, with steep grades, sharp curves, and a rough gravel surface sometimes impassable after heavy rain or in the springtime.

As most of us are probably aware, the Saguenay District includes the city of Chicoutimi, the towns of Jonquière, Kénogami, Arvida, Bagotville and Port Alfred, Ste. Anne and many other villages located on the shore of the Saguenay River, between the St. Lawrence River and Lake St. John. It has a population of about 100,000. The economy of the region is based partly on its agricultural communities and partly on its industrial centres, such as the aluminum plant of Arvida, the pulp and paper mills at Port Alfred and Kénogami, the textile mills and the earthenware industry, etc., in Chicoutimi, all served by the huge hydro-electric plants located on the Saguenay River at Ile Maligne, Chute à Caron and Shipshaw.

The Lake St. John District, as its name implies, includes all the towns and villages located around the lake of the same name, where many pulp and paper mills at Dolbeau and Desbiens Mills, and other industries, are located. Its economy also is based on its agricultural communities and on its industrial centres, as well as the blueberry industry which brings an annual income to the district of close to $5 millions annually, mostly from exports to the United States. Its population is also close to 100,000. Moreover, Lake St. John is the gateway to the very promising mining districts of Chibougamou and Mistassini, which have remained unexploited owing to the lack of road communications with the Lake St. John District Railway.

Choice of a Route

Thus, it was no wonder that the Hon. Antonio Talbot, minister of roads for the Province of Quebec, asked the Department of Roads in 1944 to study the problem of improving, if at all possible, one of the three roads leading to the above districts. During the preliminary stages of our study we early concluded that only one of the existing roads could be improved or rebuilt to a standard that would meet the needs of the communities concerned. Route 16, the 206-mile road from Quebec via St. Siméon and Bagotville, where the scenery is most picturesque, has heavy grades and sharp curves, which made it unacceptable. Route 56, from Quebec via Baie St. Paul, St. Urbain and Bagotville, was also found unacceptable because of its topography, which necessitated sharp curves and steep grades. We were thus left with Route 54. actually built to a good standard as far as Notre Dame des Laurentides and leading to the Lake St. John District, which could be improved part of the way. The topography gave promise that a highway could be built at reasonable cost, with grades and curves that would allow vehicles to travel at a moderate rate of speed with full pay loads.

Before proceeding further with our study, however, it was decided that an air survey should be made of all the area between Quebec City and the Saguenay River and Lake St. John. Arrangements were made with Canadian Pacific Airlines to make air photographs of the district, from which a series of maps of the country could be produced. These maps were studied carefully with a stereoscope and a tentative centre line of the new highway was drawn. Following this the author, accompanied by the assistant chief engineer, the chief surveyor, and the district engineer, flew over the territory at a low altitude, following the projected centre line. Our observations led to the conclusion that this centre line should be staked on the ground, and this was done.

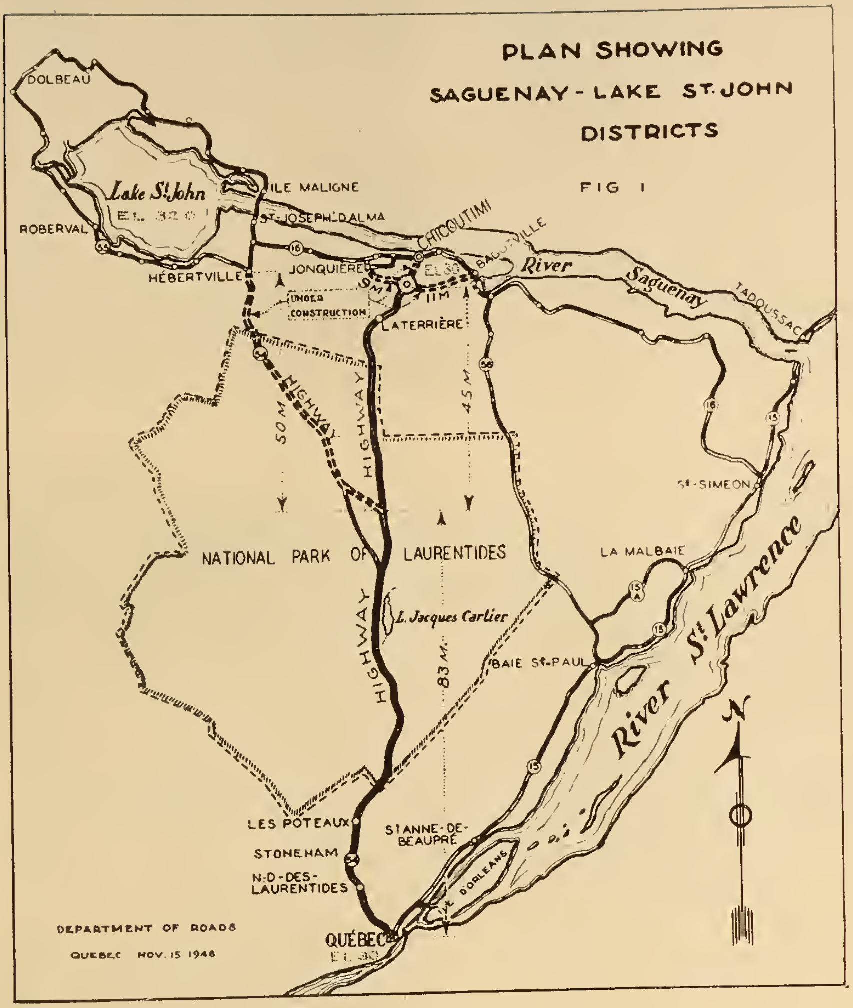

Fig. 1.

The adopted location of the new highway starts at Notre Dame des Laurentides, to follow at a short distance the existing Route 54 to Lake Jacques Cartier (Fig. 1) for some 58 miles. It then runs true north for 13 miles, so as to serve both the Saguenay and Lake St. John Districts. From this point one road branches west to follow Route 54 northwest to Hébertville, 50 miles away, this being the entrance to the Lake St. John District. The other branch continues straight north for 47 miles, and leads to a traffic circle of 400 feet inside diameter, where traffic is directed west, east, or north, to serve Arvida, Kénogami and Jonquière, or Bagotville, Port Alfred and Grande Baie, or the Chicoutimi region, respectively.

Standards and Specifications

The standard of the highway was decided upon after considering not so much the present density of traffic but rather the future requirements of the districts, which are due for great expansion in the near future. The loads that trucks would haul between Quebec City and the various industrial centres of the districts guided us in establishing the maximum grades permissible, together with the maximum degree of curvature, as the highway runs through a very hilly country. We came to the conclusion that the steepest grade should not exceed 7.50 per cent and that the curves should not be over 6 degrees with a system of easement curves of spirals so visibility would at all times never be less than 600 feet and in most cases be 1,000 feet. The super-elevation on curves would be computed to permit a safe speed of 60 miles an hour.

The cross-section of the highway based on a 100-foot right of way, provides for a pavement of 24 feet, with shoulders of not less than 8 feet, and with a subgrade

Fig. 2. (Top) A section surveyed prior to rock blasting.

Fig. 3. Muskeg and mire in the Lake Jacques Cartier district.

Fig. 4. Old Road 54, opened in 1929, following construction of the power line.

Fig. 5. Northern section—filling and grading—near Lake Bouleaux.

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46 feet wide on which an 18-inch gravel foundation would be laid, one foot depth of 3 inch crushed or natural gravel, and covered by 6 inches of 1-inch crushed gravel. After the centre line had been staked and cross-sections taken, boring tests were made by drilling holes every 100 feet over the length of the highway, to establish the nature of the soil to be graded. Our specifications were then prepared to provide the construction of a highway which would conform to the most modern techniques of highway engineering.

Our specifications provided that whenever muskeg, black muck, silt or any material of dubious quality was encountered, it was to be removed and replaced by a granular material, such as sand and gravel. In the rock cuts, the excavation was to be made two feet below grade, and the last two feet refilled with gravel or sand, so as to give our roads a foundation of uniform quality and flexibility. Of course drainage was provided to keep the water table at least four feet below the elevation of the subgrade. The slopes in the cuts and fills ranged between $1\frac{1}{2}$ to 1 and 2 to 1, depending on the nature of the soil.

Fortunately, no clay of any kind was encountered, though muskeg, silt and black muck were met with at many points. The balance of the material to be excavated was mostly sand, gravel and solid rock. To our great surprise, we struck perma-frost on a section many miles in length, which made it necessary to dig in frozen ground during July and August of 1947 and 1948. We also had to battle against the work of the first Canadian engineer — the one that practiced long before the Engineering Institute was founded—in fact, his work has been an inspiration for the crest of the Institute. I refer to the Canadian BEAVER.

On one section of the new highway we were faced with a water elevation on Lake Tourangeau about four feet higher than had been recorded when the survey was made. Before raising the profile of the road, our resident engineer made a careful inspection of the outlet of the lake to see if there was any obstruction to cause such a high level of the water. To his great surprise, he found a newly built beaver dam across the outlet. This dam was blasted five to six times before the beaver colony moved out.

Construction Procedure

When the survey of the new highway was completed in 1945, it was decided that two sections were more urgent than the others. Since Route 54 was paved up to the Posts at Stoneham, it was thought that the first part to be built should be the section between the Posts and Lake Jacques Cartier, a distance of 48 miles. This stretch was common to both districts of Lake St. John and Saguenay, and it was very narrow and winding with steep grades and sharp curves. It was considered that the other to be given preference should be the one between Lake Jacques-Cartier and Laterrière, a distance of 54 miles, since part of this section is also common to both districts. Moreover, it leads to other existing roads serving the Saguenay District.

Two contracts were awarded: one to Cartier Construction Limited, of Montreal, for a section of 48 miles extending between the Posts at Stoneham and Lake Jacques Cartier; the other to the Champlain Construction Co., of Montreal, for a section of 54 miles, between Laterriere and Lake Jacques Cartier. The above firms are the largest road contractors in Canada. Clearing was all completed from one end to the other in the fall of 1945. The side ditches were also started in the same fall and a few culverts built.

Fig. 6. (Top) South section of the new highway, under construction.

Fig. 7. Road beside Lake Jacques Cartier.

Fig. 8. The old and new highways, between Stoneham and Jacques Cartier.

Fig. 9. A curve on the road to Stoneham.

Fig. 10. The section of the highway near Lake Tourangeau—looking toward Quebec.

The first section did not offer any difficult problems to the contractor. Route 54 was either running parallel to the new highway or crossing it at various points, though the rock removal was a special problem for the Cartier Company engineers, who were working alongside the high tension wires of the Shawinigan transmission line. In two instances power had to be cut off momentarily while blasts were fired, but no damage occurred. However, beside Lake Jacques Cartier where a steep cliff complicated the problem, seven powerline towers had to be moved to make way for the highway. The second section ran through virgin forest with no mode of communication of any kind. The contractor had to build tote roads all the way and erect camps at every ten miles. His main camp was located at the north end of his contract at Laterriere, ten miles away from the nearest rail siding.

The grading, culverts, and bridges, together with the gravelling, proceeded during the seasons of 1946, 1947 and 1948, and your attention is drawn to the fact that the season during which work can be done under normal conditions is very short, about 115 working days per year. On November 1st, 1948, grading was completed on

Fig. 11. Removing muskeg from the right of way of the highway in Laurentides Park, Quebec. "Caterpillar" Diesel powered Lorain Clamshell loads the muskeg into an athey forged track wagon pulled by a "Caterpillar" Diesel D-7 tractor.

these two sections. Sixty miles of 3-inch black base had also been laid on the sections of the road where the grading was completed in 1946 and early in 1947. The other sections should be covered with a black base this year. The 2-inch wearing surface will not be laid before 1950 or 1951, depending on the conditions of the subgrade.

To give you an idea of the magnitude of the work done on these two sections, the following is a list of the main items of the contracts:

- Clearing: 1,430 acres
- Rock excavation: 1,247,934 cubic yards
- Earth excavation: 2,208,635 cubic yards
- Borrow: 1,689,507 cubic yards
- Muskeg, black muck, silt: 743,894 cubic yards
- Gravel foundations: 2,131,856 tons
- Reinforcing: 1,500,000 lbs.
- Concrete: 45,000 cubic yards.
- Dynamite: over 2,000,000 lbs.

A Shorter, More Scenic Route

The construction of these two sections opened to traffic has reduced the distance from Quebec to the Saguenay District from 206 and 155 to 130 miles, while the time of travel has been shortened from five to two hours. It has also reduced the time from Quebec to Lake St. John by almost two hours.

This new highway starting at Quebec, where the elevation is 50 feet above sea level, runs up to 2,800 feet and continues at an elevation of some 2,500 feet for 50 miles, then it falls gradually to an elevation of some 30 feet above sea level in the Saguenay District, and of 300 feet above sea level at Lake St. John. It runs through the Laurentian Mountains all the way, 85 miles of which is through the National Park. It crosses a few small rivers and hugs the shore of some beautiful lakes; it goes up mountain tops and down gorgeous valleys; it opens up a beautiful country unknown to most of us.

The scenery, all along the new highway, is so different from and above the ordinary that we cannot fail to admire nature at its best. In the fall, the spectacle is simply grand and some spots are quite beyond description. In winter the road is flanked by thousands of christmas trees, which makes it most attractive at all seasons. With all this beautiful scenery, the new highway brings 200,000 Canadians closer to the picturesque City of Quebec, the capital of the Province.

Work has already started on three other sections, and this new highway when completed will really be an asset, not only to the Province but to the whole of Canada. Moreover, it will be a high tribute to the wisdom and skill of our Quebec engineers. Longer and wider highways have been built in Canada and U.S.A., but it is doubtful if a finer highway was ever built in either country.

Fig. 12. Northern section, between Lake Jacques Cartier and Laterriere.

Engineers Move Into Politics

by Frank Flaherty

C. D. Howe, who is usually looking ahead, recently took time off to look back and think about his own profession, engineering. He came up with some startling facts about the extent to which engineers have come to occupy an influential place in modern society. He noted that when he entered the cabinet in 1935, he was the first professional engineer to serve in any British Commonwealth government. Now, he said, there are two engineers in the Cabinet. This may or may not indicate that engineers are on the way to replacing lawyers in senior government posts.

In his youth there were about 1,500 engineers in all Canada. Today, while the population is only twice as large, there are ten times as many engineers. The number of people employed in industry had about doubled, freight carried on railways had increased four times. Telephone business had increased eight times. The only other item in the national economy which kept pace with the increase in the number of engineers was the national debt and Howe disclaimed any relationship. Engineers were and have been finding places not only in the technical spheres for which they are trained (and which provide increasing opportunities) but in operating, executive and administrative branches of business and government. This he considered proof of the importance of science and technology in modern industrial and economic life. He predicted the trend would continue.

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High Speed Photography

by

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High speed photography may be considered as being merely one phase of instrumentation — the study of measurement and control techniques. The scientific literature of the last seventy years is replete with references to the use of high speed photographic techniques in the investigation of physical problems. One significant fact emerges from a study of this literature; the subject is characterized by a great diversity of equipment and method.

In general, it would seem, when a research organization has been faced with a problem amenable to a solution in terms of pictures taken in minute intervals of time, then the specific photographic apparatus and its mode of operation have been designed by the research workers themselves. There is still no universally applicable high speed camera or photographic technique. It will, then, be readily seen that a complete coverage of the many ramifications of the high speed photographic field lies outside the scope of a short paper. This being the case, it is possible here only to indicate the main techniques, and then to dwell at some length on specific techniques and applications which are currently in use at the Canadian Armament Research and Development Establishment at Valcartier.

Table I is a breakdown of high speed photographic methods; those which have been used in the past at Valcartier, or concerning which active research is being carried on at the present time, are noted by stars. As the several methods are considered, it will become increasingly apparent that the mere taking of pictures at a high number of individual exposures or frames per second is not a complete solution

Fig. 1. (Above) Spurious lighting due to impact of a shell on armour plate.

Defining the principal techniques of high speed photography, the author described the procedure with still cameras, with high speed movie cameras and with drum cameras. Methods of illumination and floodlighting are discussed, as well as flash photography, using microflash light and photoelectric cells. A detailed description of the "Kerr Cell" and its uses is given, outlining its properties and electronic aspects. Synchronization of light flashes by mirrors for photographing projectiles in flight is also discussed.

TABLE I

HIGH SPEED PHOTOGRAPHY

(a) Via "still" cameras
- i Multiple spark*
- ii Microflash*
- iii Kerr Cell*

(b) Moving film cameras (continuous film or drum type)
- i High speed movie cameras*
- ii Drum cameras
- iii Multiple flash

to the problem of high speed photography. There are other requirements to consider; perhaps one particular physical problem may be solved by the taking of a single picture with an effective exposure time of 0.04 microseconds. It is just as likely that a greater exposure time, but with the added advantage of a greater number of exposures (say a thousand or more), may be much more appropriate in the solution of another problem.

It will also be noted that many of the high speed techniques, with exposures in the order of microseconds, produce only shadow pictures of the objects or events, as opposed to the more desirable front light pictures. Furthermore, there is the additional fact to consider as to whether the technique employed lends itself to the re-projection of the individual pictures in such a manner as to provide a photographic history in "slow motion" of the subject under investigation.

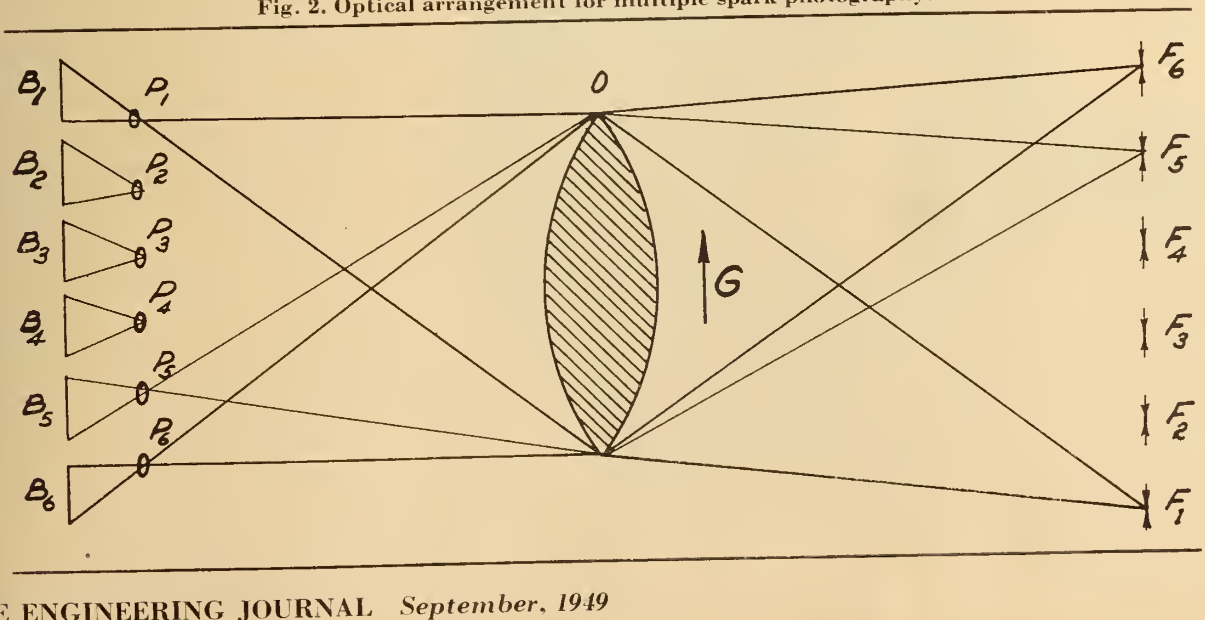
High Speed Photography With Still Cameras

To begin, let us consider a specific high speed photographic technique, whereby perfectly good pictures of projectiles in very rapid motion could be obtained at the rate of some three million exposures per second. It may be noted that the actual physical problems, which forced the development of the technique to be described, have many features in common with some problems which are of every day concern to the research staff; that is to say, they were problems in ballistics. As far back as 1929, the German ballisticians, Cranz and Schardin, had developed a method of high speed multiple spark photography, (Fig. 2). The problem is to obtain a sequence of pictures of a projectile in flight, in order to study deformation of a projectile in flight, yaw and spin.

The method, which is limited in practice to a maximum number of twenty-four separate pictures in sequence, operates as follows:- The projectile in flight passes in close proximity to a large condensing lens O. This lens is flooded in sequence by light from a set of high voltage spark gaps, which we will for simplicity consider to be located along a straight line in a horizontal plane. Corresponding to each individual spark gap there is a separate camera, represented by B_1 to B_6. It will be observed that each camera sees a shadow of the projectile against a bright field provided by its associated spark gap. The actual time interval of each exposure, as well as the interval between successive exposures, is governed entirely by the electrical constants of the circuit employed to drive the spark gaps. This circuit is illustrated in Fig. 3.

It will be observed that the inductances are used to produce the delay in firing between successive spark gaps. It is interesting to note that when the inductances are reduced to the order of inductance associated with a straight wire (order of microhenries), then exposures at the rate of three million per second can be readily attained. It will be seen that the method is limited by both geometrical and optical considerations. If the number of gaps and associated cameras are increased, then the pictures will depart excessively from a common point of view, not to mention the fact that the aperture of the condensing lens becomes impractical. It might be mentioned that the method can be extended to the taking of front light photographs by increasing the energy content of

Fig. 2. Optical arrangement for multiple spark photography.



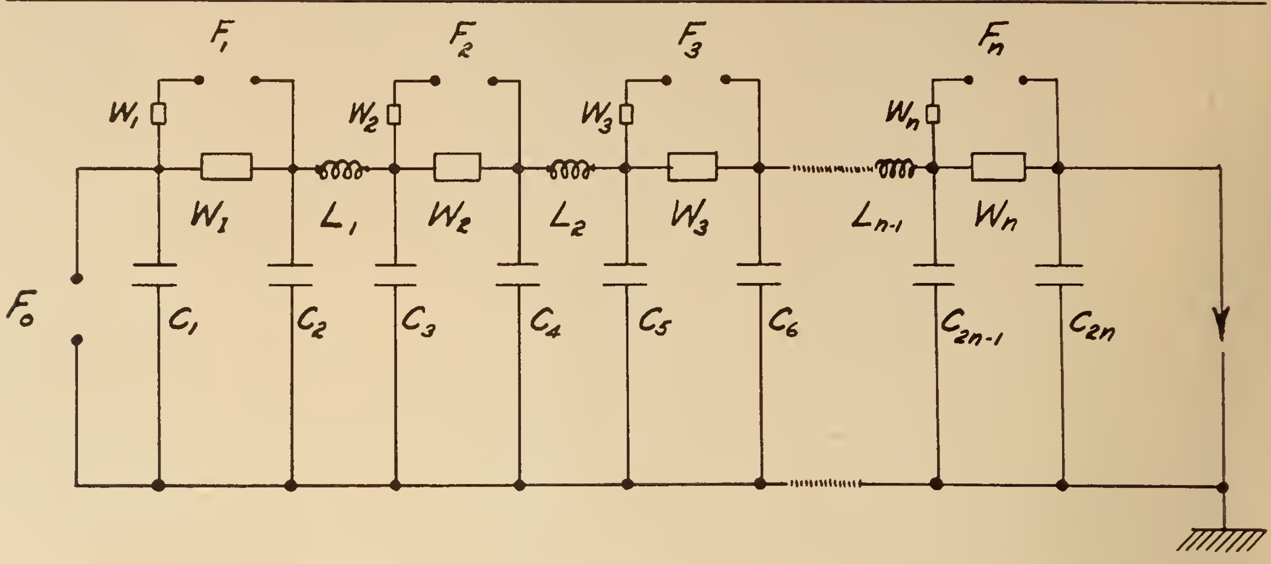


Fig. 3. Electrical arrangement for multiple spark photography.

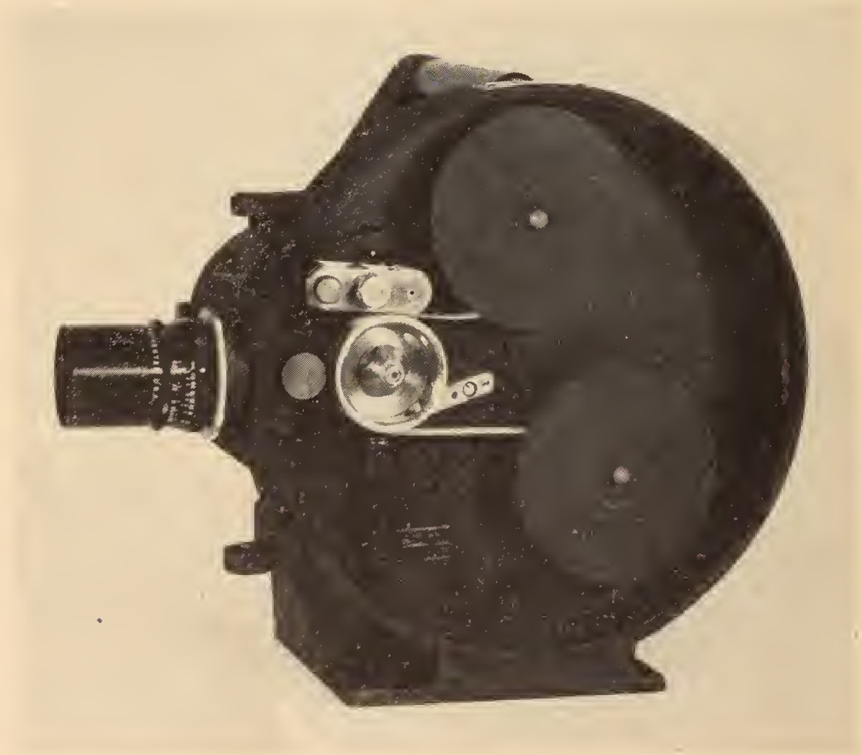
the condensers, and by replacing the simple spark gaps by special electrical gas discharge lamps. This, however, leads to further technical difficulties, which will be considered later.

Photography With Movie Cameras

In contrast to the above method, which is basically electrical in its nature, consider the modern high speed movie camera. The most versatile of such instruments, from the viewpoint of physical and engineering research work, is the "FASTAX" camera, manufactured by the Western Electric Company. It may be obtained in three models corresponding to the following film sizes: 35 mm., 16 mm., and 8 mm. These have maximum speeds respectively of 3,500, 4,000 and 8,000 frames per second. A special control device manufactured by the Industrial Timer Corporation makes it possible to extend these upper limits by a factor of a third or so.

In order to explain the mode of operation of this camera a film has been produced by our photographic laboratory, to illustrate the main functional details of the camera itself and then to show examples of the application of the instrument to a variety of physical problems.

Fig. 4. The Western Electric "Fastax" camera.



In the conventional movie camera, to produce the individual picture it is necessary that some form of shutter be introduced to limit the amount of light incident upon the film, and to avoid blurring of the image on the film, it is necessary that the section of the film to be exposed be brought instantaneously to rest with respect to the image formed by the lens. Normally the shutter is of the sector disc type while the film is brought to rest for the periods of exposure by a type of racking mechanism.

A moment's thought will show that the mechanical strength of the film itself will soon impose an upper limit on the speed of such a camera as an attempt is made to increase the number of frames per second, hence designers have had to produce cameras in which the film runs continuously through the instrument. Then the problem is to design an optical system whereby the image formed on the film during exposure can be made to travel at the same speed as the film (i.e. with zero relative velocity with respect to the film). In the case of the Fastax, both the shutter action and the correction for film movement are effected by a multi-sided rotating prism located just behind the lens of the camera (Fig. 4). The rotary motion of the prism is accurately synchronized with that of the motor driving the film sprocket, so as to insure that the successive images move at the same speed as the film itself.

The advantages of this mode of high speed photography over that previously described are (1) a greater number of pictures are produced and these can be projected by conventional projectors at the rate of say 16 frames per second, thereby giving a slow-motion record of the actual motion and (2) no elaborate registration process is necessary in order to correct the individual picture for slight changes in the angle of view as with the multiple spark method. The main disadvantage lies in the much longer time of exposure, 90 microseconds for the upper speed limit of the 16-mm. Fastax as compared with an exposure of the order of 0.1 microseconds for the former method.

Photography With Drum Cameras

It will, of course, be noted that again the mechanical strength of the film comes into the picture as, at the fastest speeds, severe stresses are imparted to the film and the danger of film tearing becomes an ever present difficulty. To escape this limitation, some investigators have resorted to the drum type of camera, where the film is wrapped closely around the periphery of a metallic drum. A compensating optical system involving a rotating prism as before is used, to provide both shutter action and the necessary cancellation of movement between image and moving film. By means of cameras operating in the vicinity of 40,000 frames per second of this type, excellent pictures have been obtained of such phenomena as the flame and detonation waves in the cylinder of an internal combustion engine.

Illumination And Floodlighting

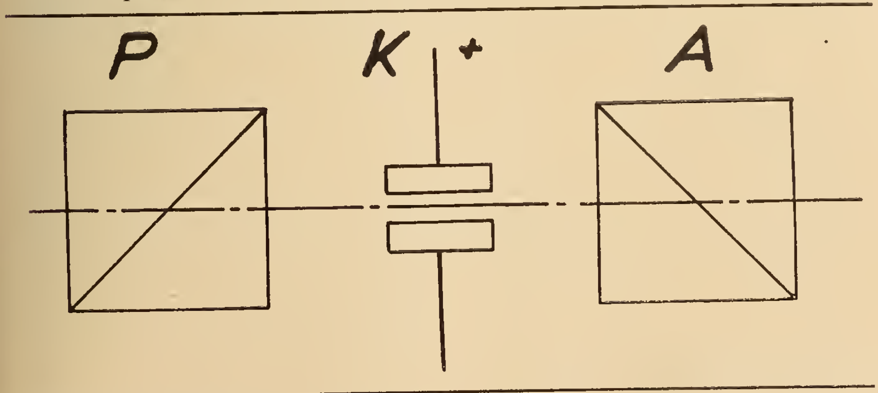
In order to obtain pictures of rapidly changing phenomena with a camera of the Fastax type, the subject must be highly illuminated with a battery of high power floodlights. Furthermore, the provision of the accurate compensating devices which have been formerly discussed involve extreme mechanical and optical accuracy and, therefore, great expense. To overcome these two disadvantages (unfortunately at the expense of speed) the system of multiple flash photography was designed by Egerton and his associates. In this method, the film moves continuously behind the camera lens as before, but both shutter and compensating devices are eliminated, the duration of the exposure being limited only by the period of repetitive light flashes which produce the individual exposures. The amount of film movement during exposure in practice is negligible, the effective exposure being of the order of 10 microseconds.

Apparatus of this type currently available on the market may be exemplified by the General Radio "Strobolux" which can produce flashes of some 15 to 50 microseconds duration at the rate of 100 flashes per second (Maximum), and by the 621-M Power Stroboscope manufactured by the same company. This latter equipment has an effective photographic flash period of 10 microseconds and enables photographic recording at the rate of 1,500 frames per second.

We have frequently used the continuous film camera, which is an essential part of the above equipment as a means of recording high speed transient phenomena portrayed on the face of a Cathode Ray Oscilloscope, the film itself providing a "time base" for the recording of the particular movements of the "spot" on the 'scope face.

Fig. 5. Range set-up for single flash photography of projectiles.

Fig. 6. Elementary schematic diagram of Kerr Cell electro-optical shutter. P and A represent the polarizer and analyzer; and K is the Kerr Cell.



Flash Photography

Let us return now to the "still" camera aspect of high speed photography. It has already been noted that the multiple spark method can be conveniently applied to obtain shadow pictures of projectiles in flight. Very often, however, adequate information concerning, for example, whether or not the projectile has followed the rifling grooves in the gun barrel precisely, or whether it has jumped in the firing process, can be obtained from a single front light photograph of the projectile in flight. For such studies we have consistently made use of the method of single flash photography, using a commercial high intensity flash lamp of some two microseconds flash duration, manufactured by the General Radio Co. and known as the " Microflash ".

The source of light in this instrument is a high energy electrical arc type of discharge, in either a pure rare gas or a mixture of rare gases at pressures in excess of atmospheric. Quite recently we have designed and built our own unit wherein a special Krypton lamp, manufactured by the Westinghouse Co., for application in a new type of aircraft landing approach system, has been used as the light source. The sudden release of energy through the lamp itself is effected by the discharge of electrical energy stored in a charged condenser; typical values for such units are a 1/3 microfarad condenser charged to 8,000 volts.

Let us consider a typical problem and the experimental arrangement adopted for its solution. It is desired to obtain a single high speed picture of a shell travelling at the rate of 2400 feet per second. The shell in flight passes through two apertures cut into opposite sides of a concrete block-house. Within the house itself a conventional Eastman " Speed Graphic " camera is set up to view a portion of the trajectory. Beside the camera, the Microflash is located with the internal condenser fully charged.

The operational sequence is as follows:—the gun fires and, in so doing, trips an inertia switch which causes the ordinary shutter of the camera to open for say 1/100 of a second. This allows sufficient time for the projectile to reach the interior of the house. As the projectile reaches the particular point in the enclosure at which the camera is focussed, it interrupts a beam of light causing an electrical signal to be generated at the terminals of a photoelectric cell. The cell, after due amplification, triggers the Microflash light, whereupon the picture is taken. Following this event the shutter closes to prevent fogging of the film by ambient light. Fig. 5 shows the set up of the equipment within the blockhouse.

Ultra High-speed or "Kerr Cell" Photography

In conclusion, an attempt will be made to outline briefly a distinctly different type of ultra-high speed photography on which much research work has been carried out both in Great Britain and the U.S.A. within the past two or three years. This particular method is known as " Kerr Cell Photography ". To begin let us consider the elementary properties of the electro-optical device known as a " Kerr Cell ". The physicist Kerr, in the latter part of the past century, discovered that certain substances possessed the ability to rotate the plane of polarization of polarized light as soon as an intense electrostatic field was impressed upon them. The process is somewhat more complicated than a simple rotation of the polarization plane, and is not to be confused with the simple optical rotation produced by some substances in their natural state, notably certain carbohydrates in solution. For the purposes of this discussion, however, it is entirely adequate to consider the process as being a simple rotation of the plane by an amount dependent upon (a) the electrical field strength impressed upon the substance, (b) the length of the optical path in the medium between the electrodes and (c) a specific property of the substance itself, due to the polar nature of its molecules, and measured by a so-called " Kerr Constant " for the individual substance. The polar molecular organic compound Nitrobenzene has been found to exhibit a Kerr effect of much greater magnitude than any other substance.

In Fig. 6, *K* represents a Kerr Cell consisting simply of a glass container, in which a pair of plane metal electrodes are immersed in Nitrobenzene. *P* is some type of polarizing device, whereby the greater portion of the light coming from the left hand side of the picture is plane polarized when incident upon the cell. *A* is another polarizing device set with its polarization plane at right angles to that of the first polarizer. From elementary physical optics we note that the amount of light transmitted through the set up will be a minimum in practice and, ideally, zero.

Suppose now an electrical potential which in actual practice ranges from the order of 5000 to 40,000 volts be applied for a short time across the terminals of the cell. We have noted above that the cell produces an effective rotation of the plane of polarization when exposed to an electric field. Accordingly we would expect a considerable portion of light to be transmitted through the combination. This does actually happen in practice. We have here a type of shutter which is free from the inertia of the ordinary mechanical and mechano-optical device. It might, however, be anticipated that some time lag might exist between the application of the potential and the action of the cell.

Recent measurements on such cells have shown this time lag to be of the order of one thousandth of a micro-second, an amount which can be entirely disregarded in practice. Probably the lower limit of exposure times presently obtained with such an electro-optical shutter is the value of 0.04 microseconds, which Zarem of the U.S. Naval Ordnance Test Station at Inyokern released recently in some scientific and engineering journals.

Properties of the Kerr Cell

Investigations into the properties and peculiarities of these Kerr Cells, and also into the design of electronic circuits for the production of the necessary high voltage and short duration pulses, have been actively carried out at our establishment over the past five months. The particular application of the cell in which we are interested is that of an auxiliary shutter, to be used in conjunction with a conventional fast acting mechanical shutter. Consider the problem of photographing a projectile at the precise instant at which it strikes an armour plate. The basic photographic arrangement will obviously be that of the Microflash method previously described, but one new factor must be taken into account. We saw that the mechanical shutter of the camera must be opened for an interval of, say, one one hundredth of a second. Sometime within this interval the flash of two microseconds duration occurs. Furthermore, the camera is located in an enclosure in which the ambient light level is very low and insufficient to fog the film during the 1/100 sec. opening of the camera shutter.

In the case of the projectile striking the armour plate, however, a considerable amount of fairly high intensity light is produced by the impact, as a few sample pictures of such an event will show. (Fig. 1) This light would be more than sufficient to fog the film in even the short exposure time of 1/100 second. Consequently an additional supporting shutter mechanism is necessary, and this action can be adequately provided by a Kerr Cell. Sufficient residual light transmission occurs, even through the best of cells, to force the retention of the mechanical shutter, particularly if the experiment is to be carried out in broad daylight.

Electronic Aspects

To digress from the main topic, we might consider the electronic aspect of the problem, namely the production of the actuating voltage pulses for the cell. These pulses for our particular application should have a duration of two microseconds, a voltage peak of some thirty-six thousand volts and an approximate rectangular pulse wave-form.

The first system whereby it was finally possible to obtain rectangular voltage pulses of two point five microseconds duration and of amplitude sixteen thousand volts uses standard Radar modulation techniques. A pulse forming network is charged to 6000 volts. It is then suddenly short circuited by means of a hydrogen thyraton switch across the primary of a suitable transformer, having a substantially uniform response between sixty kilocycles and 100 megacycles.

This device is known in Radar parlance as a "pulse transformer". It is shown by standard theory that exactly one half of the initial voltage to which the network was charged appears across the primary of the transformer, the voltage wave-form being determined in shape and duration by the electrical constants of the network. With the step up ratio of the available transformers it is possible to obtain 16 kilovolt pulses across the secondary terminals when suitable electrical matching arrangements have been fulfilled. It is unfortunate that the optical requirements of our problem necessitate a minimum of 36 kilovolt pulses. This pulse producing system will, therefore, have to be reserved for some other problem requiring a cell of much less aperture and, therefore, requiring a lesser driving voltage.

The second pulse producing system employs a slightly modified form of the conventional Marx generator, a device which is in common use for the high voltage testing of cables under sudden transient conditions. In this electronic circuit, provision is made to charge a set of special condensers in parallel, and then to suddenly switch them in series. This builds up a voltage across the chain of condensers which is approximately 90 per cent of the product of the initial charging voltage, multiplied by the number of separate condensers. Switching is achieved by means of a set of spark-gaps located between individual condensers. The entire system can be initiated simply by causing one of the gaps to fire.

This is effected in practice by sparking a high voltage tesla induction coil in close proximity to one of the gaps, thereby providing the necessary few ions to produce breakdown of the gap.

Now the voltage produced across the entire chain of condensers follows the exponential time relationship of the simple condenser discharge through a purely resistive circuit. This fact tends to make the shutter opening somewhat longer than required, with the attendant possibility of fogging of the plate by ambient light from the armour plate. It has been found, however, that the gaps can be set in such a fashion that, at approximately two microseconds after initiation, the voltage across one of the gaps becomes too low to maintain the discharge across the gap, hence the chain of capacitors is thereafter open circuited. Thus we arrive at a two microsecond opening of the cell.

Other applications of the Kerr Cell shutter are (1) the taking of single high speed pictures of projectiles in broad daylight, using the Microflash technique without the necessity for the concrete enclosure and (2) the production of a set of pictures of a brightly luminous phenomena, i.e., the evaporation of a fine wire when a large electric current is suddenly impressed through it. The cell has also been employed for obtaining sequence spectrograms of the light emitted at various stages of a spark discharge.

Synchronization by Mirrors

To return now to the problem as formerly stated, it is planned to use a similar arrangement to that for microflash photography, although it will be necessary for both the camera assembly and the flashing light source to be protected from flying fragments of the armour plate. This can be most conveniently accomplished by the use of mirrors. Probably it will be necessary to sacrifice one or two mirrors per recording, but this is a minor item in comparison with other expenses involved in connection with such experiments.

Again an inertia switch will be used to open the Speed Graphic camera shutter for an exposure of 0.01 seconds. Not only does the flash have to occur at the right moment, but also the Kerr Cell shutter must have its maximum opening at the beginning of the light flash. This synchronization can be achieved as follows. At a point some distance down the range, which can be determined by calculation and trial, there will be located a light beam arrangement similar to that of the Microflash system. The projectile intersecting the light beam will initiate the electronic circuit which produces the high voltage pulse for the Kerr Cell. (There will be a small but finite delay in the operation of the pulser, of the order of one or two microseconds). On the other hand, correct synchronization of the light source will be effected from the pulse circuit itself. It will be arranged that, at the moment that the maximum of the voltage pulse occurs across the cell, the light will flash.

In conclusion let us recall the multiple spark technique as modified for the production of front light pictures. The electrical circuit remains the same, but now there is no condensing lens to confine the light from the individual light source to its own associated camera. Light from all the sources will be incident upon each and every camera. Consequently it would be necessary in practice to equip each individual camera with a Kerr Cell shutter controlled from its own light source. It is believed that the technical difficulties of this system have yet to be overcome.

PRELIMINARY DESIGN of a LIGHT RACING AEROPLANE

by

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EDITOR'S NOTE

This is the paper for which Mr. George was awarded the Phelps Johnson Prize for 1948. It was his third year summer essay in the Applied Mechanics Option at McGill.

Although it presents nothing new to the aeronautical engineer, it should illustrate to all engineers a designer's resourcefulness in utilizing the many references now available and in co-ordinating this information in the development of a new aircraft.

Aeronautical engineers who have read the paper have said that it is an exceedingly creditable performance for a third year engineering student. It is published here as an encouragement to other students and juniors to show what can be accomplished by an undergraduate.

Mr. George graduated this year from McGill, with honours in civil engineering. It was recently announced that he has been awarded the Curtiss-Wright Aeronautical Fellowship for 1949-50 at Cornell University. His postgraduate studies for two years will lead to the degree of Master of Aeronautical Engineering.

He has also been awarded a postgraduate scholarship by the Province of Quebec, which provides for study in aeronautical engineering at Massachusetts Institute of Technology.

Ever since the National Air Races were instituted in 1926, their value to the aviation industry has been widely discussed. Those in favour of the races claim the specially prepared aeroplanes serve as proving grounds for features that are later used on military and commercial aeroplanes. Members of the opposing group contend that the improvements directly attributable to the racing planes are hardly worth the loss of life resulting from crashes. Every year, at least one or two aeroplanes crash and kill the pilots. The reason lies in the drastic steps that are taken to squeeze the last extra mile per hour from each aeroplane. It has been standard practice to build the racing planes as light as possible without going to great pains to determine if the resulting structures were strong enough. Frequently, a larger engine than necessary was installed. In other cases, a stock engine would be tampered with until it was producing half again as much power as its original rated maximum.

The post-war races have differed from pre-war events by the complete dominance of surplus military fighter planes in nearly all competitions. The homemade aeroplane can scarcely hope to out-perform one developed over a period of years with almost unlimited research facilities.

In 1947 a progressive change occurred. The Professional Race Pilots' Association of Los Angeles, California, instigated a new light plane race, based on the experience of its members who have flown in other air races. The Goodyear Tire and Rubber Company was farsighted enough to provide a trophy and $25,000 prize money. The type of aeroplane allowed to enter this event is the subject of this paper.

Specification

To work out even a preliminary design, a complete specification must be available. In addition to the specification issued by the race committee, the following points influence the projected design.

1. The object of this aeroplane is to fly as fast as possible (and win the prize money!); there must be a minimum of compromises to this objective.
2. Only one aeroplane will be built.
3. The engine and wing loading requirements ensure that most competing aircraft will be very similar as far as speed is concerned. Thus every care must be taken with details to gain even a small advantage.
4. Any additional safety features that can be built into the racer, without impairing its speed, will be appreciated by pilot and race authorities. Racing planes in the past have been exceedingly dangerous, but this race appears to be a step toward increased safety.
5. Any design using untried ideas will invariably require excessive expenditure of money and time. Considering the circumstances under which this racer will be built it must prove satisfactory after three or four flight tests.

Initial Proposals

Figure 1 illustrates a few of the initial possibilities. The flying wings (A, B) and Canard pusher (C) boast several good points for racers, but were discarded for one reason: they are far from completely proven, and it is difficult to obtain requisite data and information. Examination of any book on aircraft design or aerodynamics will reveal little information on these more radical types.

A biplane arrangement (D) might be developed with the low drag of a clean monoplane, but it has the disadvantages of high interference drag, coupled with a complexity of structure. The prone position of the pilot in sketch (E) would make it possible to reduce slightly the cross-sectional area of the fuselage. However, a new system of controls would have to be developed and the pilot would be compelled to learn how to fly lying on his stomach. This possibility was eliminated after talking to a few pilot friends.

The conventional monoplanes (F, G, H) differ only in wing position. The requirement for 30 deg. vision over the wing limits the position to one of three choices:—(1) high wing (above pilot's eyes); (2) low mid wing type (just low enough to give 30 deg. vision over the wing); and (3) low wing (right on the bottom of fuselage). Any one of these arrangements could be developed into a good racing plane. However, the conventional low wing was first choice. It offers a definite simplicity of structural design at the wing-fuselage junction, without any major aerodynamic disadvantages.

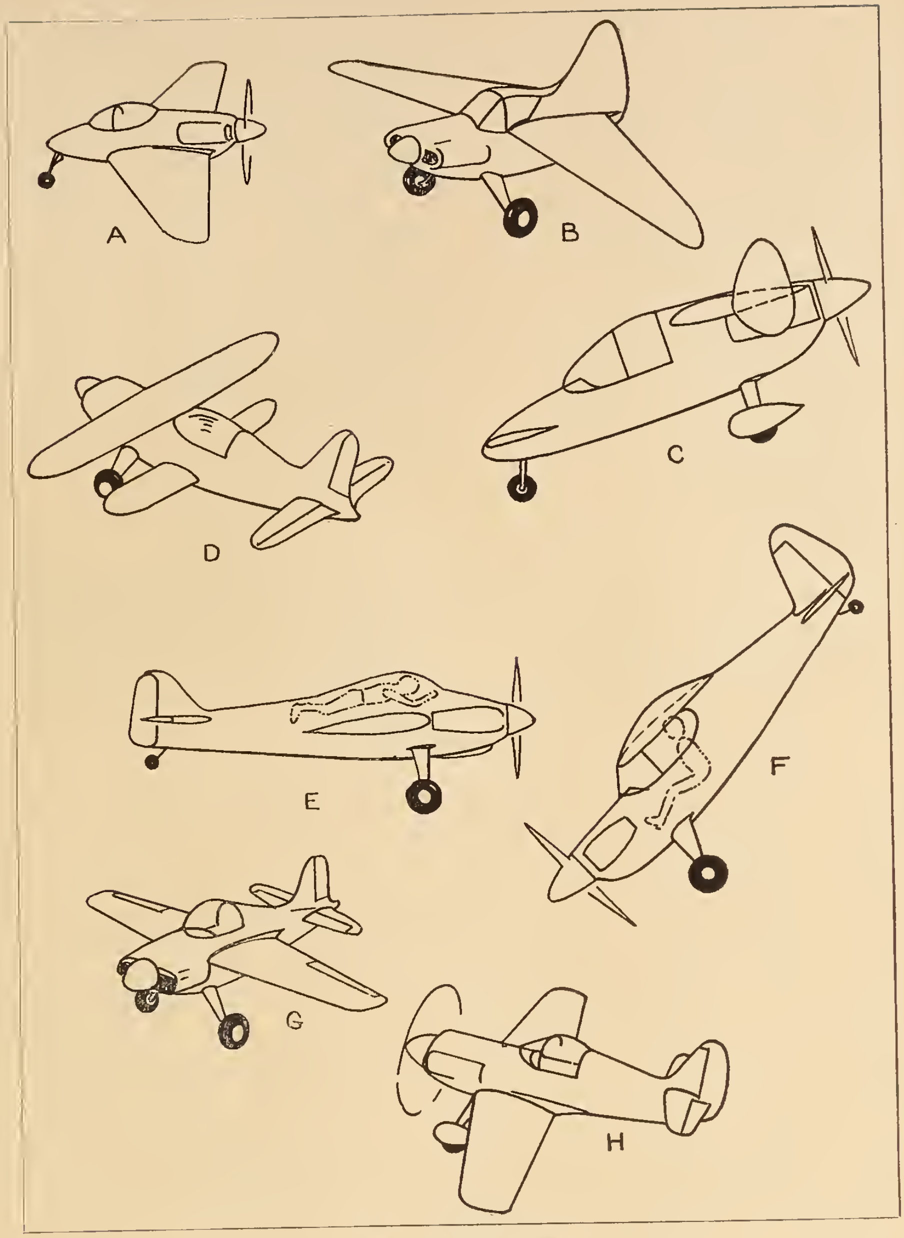


Fig. 1. Initial ideas.

Preliminary Drawing and Weight Data

An aeroplane cannot be designed in an itemized fashion the way this paper is written, because every item of design is dependent on the rest of the aeroplane; the whole design is a series of compromises. The preliminary two-view drawing (Figure 2) of the racer provides a basis for working out the relative positions and sizes of the various components. Once the approximate size of the aeroplane is determined, the weight estimation of all components is made. From these first weights, there will be changes in the arrangement and size of the aircraft. The process is continued perhaps three times until the weight and balance sheet (Table I) is accumulated.

The following is the final weight estimate with reasons for the weights assigned in Table I.

General		*lbs.*
Empty weight		600.4
Payload	pilot	165.0
	parachute	20.0
	gas (15 U.S. gallons)	90.0
	oil (1 gallon)	8.0
Gross Weight		883.4

Empty Weight Analysis	*lbs.*
Fuselage—From ⑤[1] Page 23. 12% of Gross Weight, .12×900 =	108.0
Wing—From ⑨, a wing weight of 144 lbs. is given. This is 1.92 lbs. per square foot, which seems a little low. Therefore arbitrarily increase wing weight to	152.0
Empennage—From ⑤, tail weight is 2.5% of gross weight. This is .025×900 = 22.5 lbs. Arbitrarily call for weight of	24.0
Main Undercarriage—From Goodyear Tire & Rubber Co. Inc. the following detail weights:—	

¹ Circled figures refer to list of References at the end of this paper.

	lbs.	
Tire & Tube (5.00×5)	5.5	
Wheel & Brake	5.3	
Steel Strut & Bolts (estimated)	10.0	
	20.8	
For both wheels 2×20.8 =		41.6
Tail Skid—Small leaf spring weight estimated at 3 lbs.		3.0
Wheel Fairings—Estimated from aluminum sheet required to fabricate them		4.0
Surface Controls (including Brakes)—From ⑩, and allowing for a very simple control system in a smaller aeroplane		13.0
Engine—From ⑪, engine dry weight of Continental C-85-8F (includes oil cooler and all accessories)		185.1
Cowling, Engine Mount & Firewall—From ⑩ considering smaller aircraft		12.0
Engine Controls—From ⑩		2.0

Propeller—From ①, Page A2:1, Fig. A2:2 wood propeller 5.4′ diameter		15.0
Propeller Spinner (*15 in. diameter*)—Estimated from the amount of aluminum sheet required to fabricate it		5.0
Fuel Tank (*15 U. S. gallons capacity*)—From ⑫, 0.8 lbs. per gallon for tank only; 15×0.8 = 12.0 lbs.		
Add extra for lines and fittings to give		15.0
Instruments—From ⑩		
Airspeed Indicator	0.51	
Airspeed Tube	1.00	
Altimeter	0.72	
Manifold Pressure Gauge	0.66	
Engine Gauge Unit	1.56	
Tachometer & Shaft	2.44	
Bank & Turn Indicator	0.27	
Lines, etc.	2.00	
Panel	1.50	
	10.66 say	10.7
Furnishings—From ①, Page A2:17, including shoulder harness, seat, heel plates and crash protection		10.0
Empty Weight		600.4

Fuselage, wing, and empennage weights were estimated with regard to the high strength required for the aeroplane to withstand 6g.[2] or more as specified in the official specification for the Goodyear Trophy Race.

The design gross weight of 900 lbs., (883.4 from Table I plus 16.6 lbs. allowance), is the result of these several trials and, from this weight the wing area is selected as 75 square feet (wing loading of 12 lbs. per square foot). By allowing the additional 16.6. lbs. at this stage the gross weight will be more likely to remain below the limit as set by the wing area.

Wing Design

Due to the power limitations imposed by the specification, the wing becomes singularly important on this type of aircraft. The wing loading of 12 pounds per square foot and the weight of 900 pounds has already established the wing area at 75 square feet; the problem is to design a wing to meet the following conditions:—

1. For level high speed attitude the wing must have very low drag.
2. The wing must not exhibit a premature stall at the wing tip, with consequent detrimental effect on aileron control at low speeds.
3. The depth of wing section will have to be great enough to provide the necessary strength and rigidity, without exceeding the 152 pounds allotted for wing structure.

The wing sections were chosen after examining and comparing the characteristics of over 200 airfoils from ①, ⑮, ⑯ and ⑰. However, all but 50 of these were quite useless for a fast racing plane. To facilitate the final choice a table was set up with the following columns: airfoil designation; thickness in percent of chord length; maximum lift coefficient; angle of attack where wing will have just sufficient lift to sustain the aeroplane at its maximumspeed; the drag coefficient at the above angle; and angle at which the section stalls and a note regarding the type of stall (smooth, fair, or doubtful).

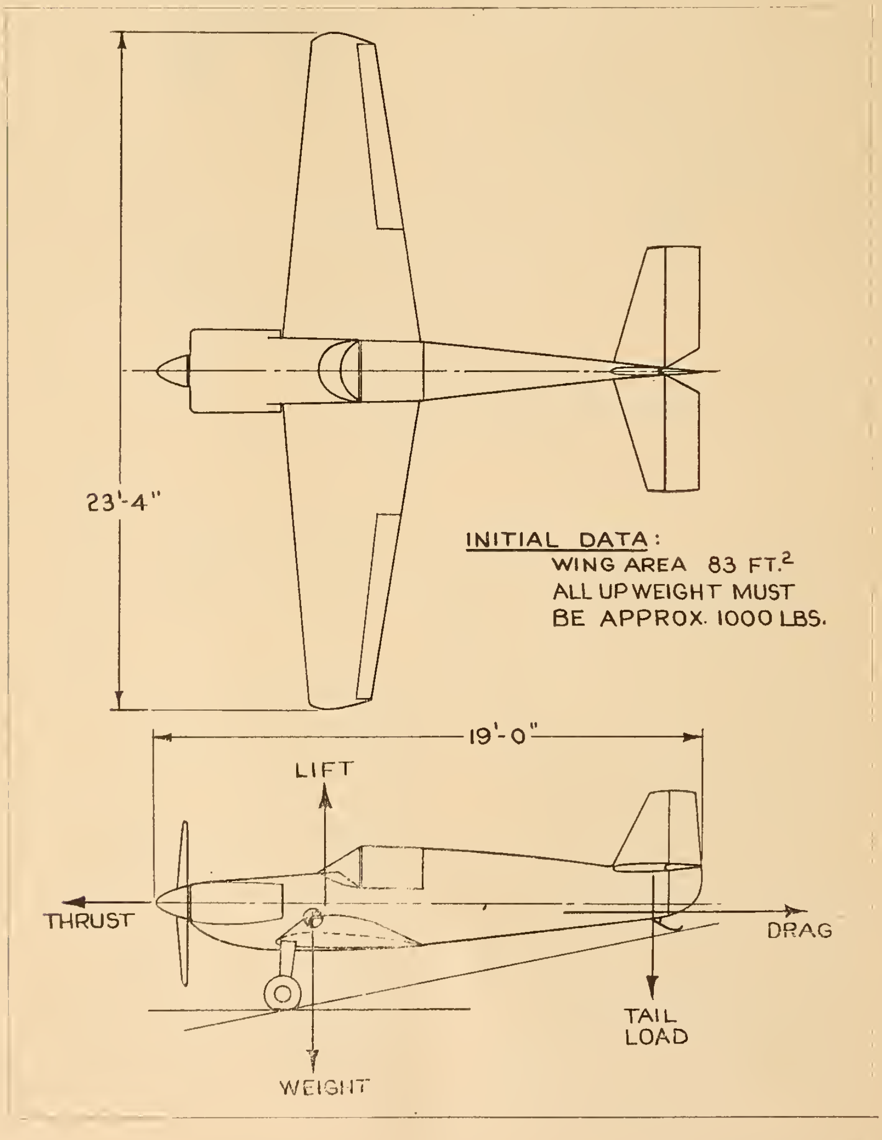
It is a long and tedious task to obtain the exact characteristics of tapered wings ⑬, therefore, in a project of this type the characteristics are estimated from Fig. 4. The difference between the Reynolds Number of the actual wing and the test airfoils, did not have a significant effect on the lift and drag coefficients. The graphs are reproductions of those in ⑧ for the sections to be used on the wing. The tip and root sections have their lowest drag coefficients at an angle of attack of 1.3 degrees (for the high speed condition). The wing root should stall five or six degrees earlier than the wing tip section. However, this difference will probably be reduced because tapered wings stall at the tip first, unless some device is used to delay the stall ⑭. The device in this case is the choice of particular airfoil sections at the root and tip.

The tip section of the wing is at the same angle as the root section, to simplify layout and fabrication of the wing. The aerodynamic centerline[3] of the wing is swept back 4½°, to bring the wing into its correct position relative to the centre of gravity.

[2] Aircraft subjected to a load 6 times its normal weight.

[3] The aerodynamic centerline is the line along which the resultant of all lift forces is assumed to act.

Fig. 2. Preliminary two-view drawing of racing aeroplane.



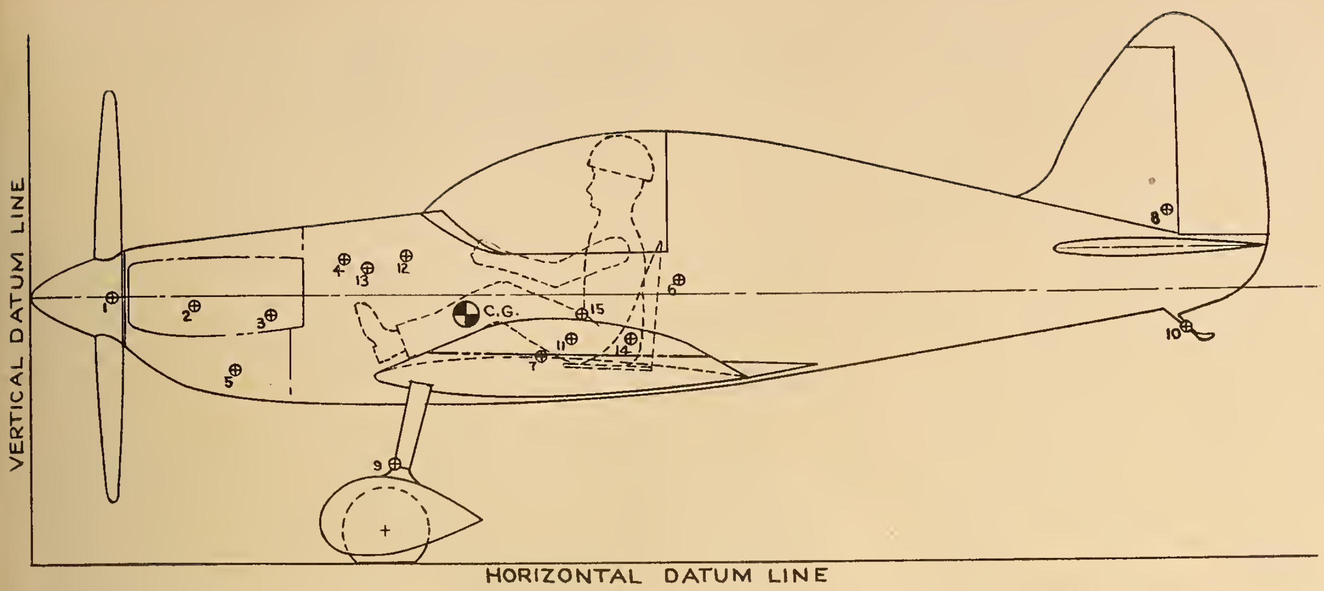


Fig. 3. Balance diagram. See Table I in conjunction with this diagram .Centre of gravity is 17 per cent aft of leading edge of the mean aerodynamic chord.

Empennage and Controls

The recommendations of Professor Bradley-Jones (2) were followed in choosing the areas of the empennage components and the ailerons. In addition a survey was made of seven light planes having approximately the same horse power. Using the areas thus determined, it was simply a matter of designing surfaces of pleasing appearance, while taking precautions to avoid points of design known to be.unsatisfactory.

A small amount of aerodynamic horn balance was included on the rudder and elevators. This serves the dual purpose of reducing the control forces slightly at high speeds, and providing a place to hang lead weights ahead of the hinge line. These weights bring the rudder or elevator closer to a state of static balance about the hinge line. For aeroplanes that fly faster than 150 miles per hour the United States Department of Commerce has suggested this type of balance as a flutter preventative (Page 210 of (2)).

An effort was made to keep the horizontal tail surface as high above the wing as the fuselage structure permitted; in this way the effect of the downwash from the wing on the tail is minimized. The horizontal stabilizer is set on the fuselage at a small negative angle to the slipstream. In this position it acts as an inverted airfoil and provides the required down load on the tail. (See Fig. 2 for all forces acting on the aeroplane in flight). All units of the tail are fully cantilevered, with a symmetrical airfoil section tapering from the root to the tip.

The cross-section on Figure 6 (Three-view) shows the simple aileron arrangement and a novel method of providing the necessary mass balance. As on the movable tail surfaces, static balance of the ailerons about the hinge line is an effective flutter preventative. The differential movement of all ailerons (10° down, 25° up) is an accepted method of reducing the drag of the "down" aileron when banking the aeroplane.

Table I—Weight and balance data for components as in Fig. 3.

No.	Item	Weight Pounds	HORIZONTAL		VERTICAL	
			Arm Inches	Moment in. lbs.	Arm Inches	Moment in. lbs.
1	Propeller and Spinner	20.0	13.0	260.0	41.8	836.0
2	Engine and Cowling	189.6	26.0	4.929.6	40.3	7,640.9
3	Firewall and Mount	7.5	38.0	285.0	38.8	291.0
4	Gas and Tank	105.0	49.6	5,208.0	48.0	5,040.0
5	Oil	8.0	32.4	259.2	30.3	242.4
6	Fuselage	108.0	102.0	11,016.0	44.7	4,827.6
7	Wing, complete	152.0	80.0	12,160.0	32.5	4,940.0
8	Empennage	24.0	178.3	4,279.2	55.0	1,320.0
9	Main Undercarriage and Fairings	45.6	57.0	2,599.2	15.5	706.0
10	Tail Skid	3.0	181.0	543.0	37.0	111.0
11	Surface Controls	13.0	85.0	1,105.0	35.4	460.2
12	Instruments	10.7	59.3	634.5	48.0	513.6
13	Engine Controls	2.0	53.0	106.0	46.4	92.8
14	Furnishings	10.0	94.5	945.0	35.0	350.0
15	Pilot and Parachute	185.0	86.5	16,002.5	39.2	7,252.0
	TOTALS	883.4*		60,332.2		34,624.3

NOTES: 1. Position of Centre of Gravity—

68.3 inches from vertical datum line.

39.2 inches above horizontal datum line.

*2. Design Gross Weight is 900 lbs.

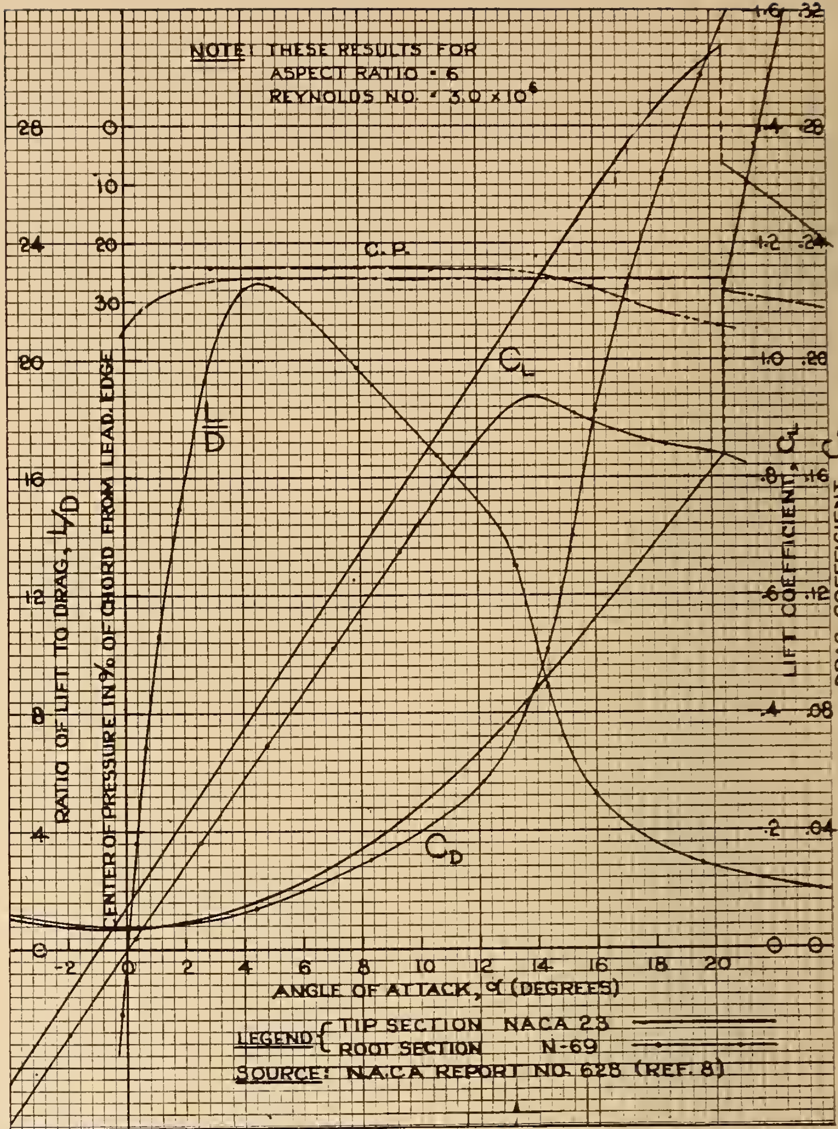
Fuselage and Landing Gear Design

The fuselage of this racing aeroplane must house the engine, all equipment, fuel, and the pilot. It must serve this purpose with an absolute minimum drag and structural weight. The cross section at the nose is set by the spinner and the outside dimensions of the engine. At the cockpit the fuselage is narrowed down and deepened just sufficiently to allow the pilot to get in, while aft of the pilot the body assumes a near-elliptical shape. The side outline of the fuselage is a compromise between low drag and pilot's visibility requirements. The large canopy of molded plastic is hinged on one side for normal entrance to and exit from the cockpit; for an emergency the hinge pins can be pulled out and the whole canopy jettisoned.

The most elementary form of undercarriage is called for on this aeroplane. From the Cessna Aircraft Company the writer copied the landing gear strut design. Basically, it consists of a flat strip of chrome-vanadium steel bolted to the fuselage. The elastic properties of the steel provide the necessary shock absorbing qualities. For this light aeroplane the steel strip of the main landing gear legs will be no heavier than one-half by three inch cross section, and a glance at the front view of the racer (Fig. 6) reveals their low frontal area. The Goodyear Tire Company kindly supplied blueprints of their wheel, tire and brake recommendations for this aeroplane weight.

Engine Installation and Choice of Propeller

To keep the aeroplanes small, light and reasonably inexpensive, the race committee wisely restricted the size of an engine that can be installed. In addition they have demanded, for safety reasons, that no



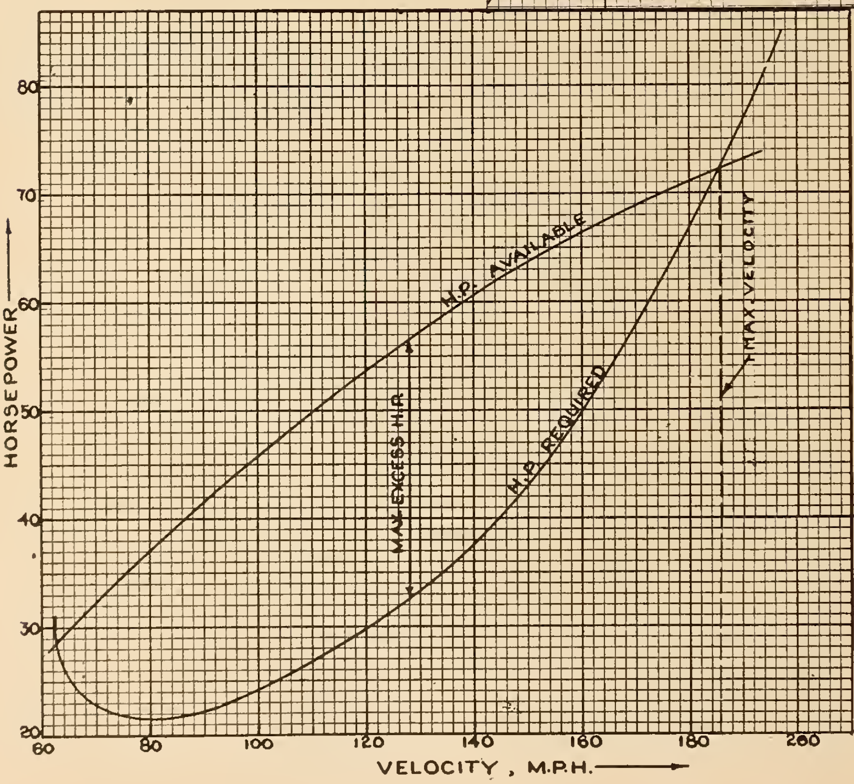


Fig. 4 (above). Graphs of airfoil characteristics.

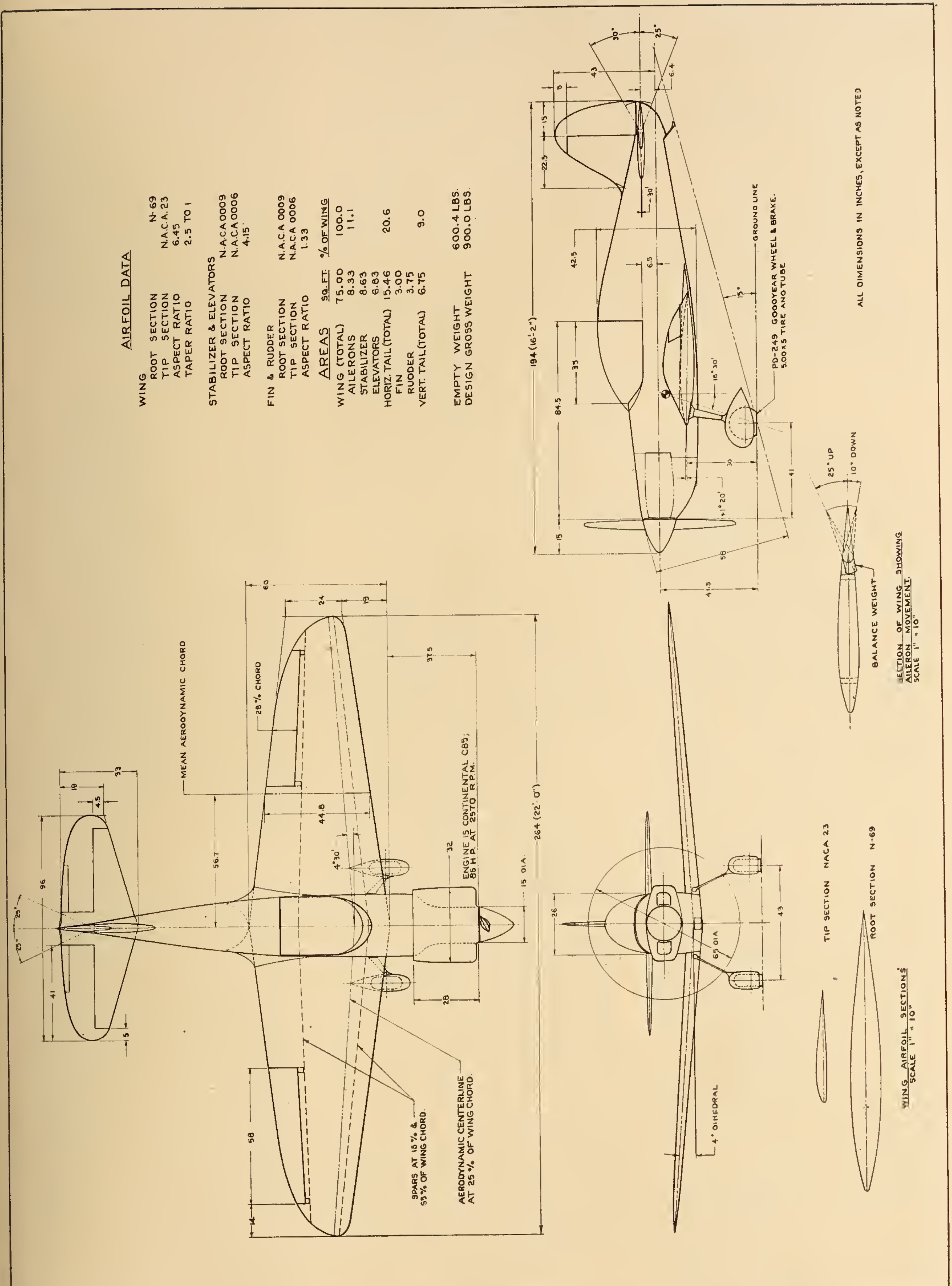
Fig. 5 (left). Graph of horsepower vs. velocity.

engine may be "souped up."[4] A Continental C-85 four-cylinder engine is currently the only one on the American market that fits the requirements. This engine develops its maximum horsepower at 2570 revolutions per minute; this is a disadvantage because a more efficient propeller is possible with a slower turning engine.

In designing the contours for the propeller spinner and engine cowling, care was taken to use a more or less standard shaped duct. There may be more efficient cowlings but their discovery would entail innumerable wind tunnel and engine cooling tests. The cowling shown

[4] Aircraft slang—meaning an engine modified to increase its maximum rated horsepower.

Fig. 6. Three-view drawing of the aeroplane.



would probably cool the engine adequately at high speed, without the penalty of excessive drag.

Selecting a propeller for this racing aeroplane involves these factors:—

1. Approximate maximum speed of aircraft (180 miles per hour).
2. Maximum brake horsepower (85 b.h.p. from (11)).
3. Maximum revolutions per minute (2570 r.p.m. from (11)).
4. Propeller to be fixed pitch and wood construction. The calculations for the selection are given in Appendix I. The high r.p.m., low horsepower and anticipated high maximum velocity call for a propeller only 5.4 feet in diameter but with a relatively high pitch.

Construction Details

A preliminary design project usually does not involve a complete study of the proposed structure. As the design progresses, however, it becomes increasingly important to think about the actual construction. If it is not expertly designed, the aeroplane's performance will be handicapped either by excess weight or by sub-standard strength.

The fuselage consists of a welded chrome-molybdenum steel tubing, faired to the final section with light metal bows and numerous wooden stringers. The wing and fixed portions of tail are wood construction with spruce ribs and spars. The light plywood covering will carry a share of the loads on the components, and at the same time make it possible to build the exposed surfaces aerodynamically clean.

For the control surfaces the novel method of construction on the DeHavilland T.K.1 racer is reproduced (19). The frame is built up from generous sized balsa wood members, reinforced by spruce along the hinge line. The frame is then covered with fabric and doped according to aircraft practice.

The details mentioned above were chosen because they are well tried (except the control surface proposal) and are easily accomplished by a small shop without factory equipment.

Special attention must be directed to the finish on this aeroplane. Every possible care should be taken to have the entire exterior surface of the racer free of all bumps, wrinkles, openings or roughness. Prior to flying in the actual race it would be worthwhile to clean and polish the aeroplane with a hard wax. Other light aeroplanes have actually increased their top speeds by seven miles per hour after improvement of the surface finish.

Performance and Stability

Now the fruits of one's labour are becoming visible. Will the projected design have the performance to make it a winner? The answer can only be found by building and flying the aeroplane, but a careful and honest estimation should be remarkably close to the actual truth.

A computation of the aeroplane's drag was compiled from every source of information available to the writer. By cross-checking the various results, values used in later calculations become more reliable. Figure 5, the graph of horsepower versus velocity, was plotted from the data and methods in Appendix II. These curves are used in estimating the performance items that follow.

Maximum Speed:

The maximum speed (at sea level) is found by the intersection of the curves of horsepower available and horsepower required. The value of 186 miles per hour for this aeroplane is quite remarkable for such a low horsepower, but reasonable, since high speed has been stressed throughout the design.

Rate of Climb at Sea Level:

This item may seem unimportant for a racing aeroplane, but it does help one to compare the project with existing aeroplanes. The rate of climb depends solely on the aeroplane's weight, and the horsepower in excess of that required in level flight:—

$$\text{Rate of climb (ft./minute)} = \frac{\text{Excess hp} \times 33{,}000}{\text{Weight}}$$

substituting values from Fig. 5, the Rate of climb =

$$\frac{24.0 \times 33{,}000}{900} = 880 \text{ feet per minute.}$$

Landing Speed:

Most racing planes have dangerously high landing speeds. It is a pleasant change to find this racer has a landing speed of only 62.5 miles per hour. This was calculated from formula:—

$$\text{Velocity (minimum)} = 19.77\sqrt{\frac{\text{Weight/Wing area}}{\text{max. lift coefficient}}}$$

$$= 19.77\sqrt{\frac{900/75}{1.2}}$$

$$= 62.5 \text{ m.p.h.}$$

The Take-off Run:

In the method of propeller selection, all assumptions were based on the high speed condition. Naturally, this means the aeroplane will be less efficient at lower speeds. For this reason it was desirable to check the take-off distance. In spite of the poor efficiency of the propeller at low speeds, the distance required for take-off from a hard surface runway has been calculated to be only 730 feet.

Radius of Turn:

The Goodyear Trophy racers must fly around four pylons spaced on the corner points of a rectangle one mile long and quarter of a mile wide. The actual pilot technique for executing these turns will play a large part in determining the pilot's average speed over the whole course. The calculated minimum radius of turn 350 feet under the best conditions, therefore the pilot will lose time if he enters the turn less than 350 feet from the pylon.

The most reliable method of finding the best radius and angle of bank for the turns will be actual runs over the prescribed race course. The pilot will be guided by the minimum time he can get around a pylon without subjecting himself or the aircraft to high accelerations of dangerous magnitude.

Conclusions

The final aeroplane configuration in Fig. 6 is a conventional low-wing cantilever monoplane, obviously designed for one purpose, air racing. It has a wing span of 22 feet, an overall length of 16 feet and a design tare weight of 600 pounds.

The fuselage is tailored to accommodate the 85 horsepower engine and a pilot of normal size. Its clean lines may be attributed to the manner in which the spinner, engine cowling and cockpit canopy have been blended into smooth contours. Excellent forward visibility is afforded by the large bubble-like canopy and the downward slope of the engine cowling. The space provided for the pilot in this type of aeroplane is of necessity kept to a minimum. This condition does not furnish exceptional comfort from a pilot's viewpoint, but the drag reduction obtained from the small fuselage more than compensates for the slight discomfort.

The importance of safety in air racing cannot be overstressed; consequently, this factor has been given prime consideration throughout the preliminary design. Every precaution has been exercised with the aerodynamic arrangement, to avoid conditions that would lead to instability during flight or flutter of the control surfaces. The main wheels are far enough ahead of the centre of gravity to minimize the chance of a nose-over if the brakes were applied suddenly. However, in the event that the aircraft should overturn, the pilot is protected by a sturdy bulkhead situated behind his head.

The composition of this paper and the research involved in formulating the design has merely been the first step in the creation of a simple racing plane. The aerodynamic form of this aeroplane could be checked by a qualified aerodynamicist or by wind tunnel tests. With the basic dimensions and shape decided, the proposed construction can be investigated thoroughly. If only one aeroplane were built, drawings and stress analyses could be confined to the main structural members. The construction of the actual aeroplane must be undertaken with constant attention to the engineering details first set down on paper. Care in selection of materials and accuracy of workmanship are essential if the completed aeroplane is to attain its calculated strength and performance.

Acknowledgments

Help from the following organizations in the way of information and advice is gratefully acknowledged:

Aircooled Motors, Incorporated;
Continental Motors Corporation;
Goodyear Tire & Rubber Company;
National Aeronautic Association.

Mr. J. P. Donnelly, chief engineer of Cancargo Aircraft Manufacturing Company, Limited, kindly allowed the writer full use of books and reports from the company files, as well as additional information from his personal collection.

Criticism and suggestions by co-employees of Cancargo Aircraft made valuable improvements to this essay and a fellow student, Walter McLeish, provided a pilot's opinion of the projected design.

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APPENDIX I

Calculations for Propeller Selection

Given:—
Max velocity (estimated)
$V = 190$ m.p.h. $= 278.5$ f.p.s.
Max. b.h.p. $= 85$ b.h.p.
Max. r.p.m. $N = 2570$ r.p.m.
Type of propeller—wood and fixed pitch

From (1), Fig. AO:15

1. Calculating value of $\frac{\text{r.p.m.}}{1000}\sqrt{\text{b.h.p.}}$

$$= \frac{2570}{1000}\sqrt{85} = 23.7$$

2. Reading along 190 m.p.h. line a value of $C_s = 2.2$ is obtained (Speed—power coefficient)

From (2) Page 172.

3. C_s of 2.2 calls for a blade angle of 28° for the best efficiency of $\eta = 0.86$.
4. $\frac{V}{ND}$ (where D = diameter in feet) is determined from Fig. 52 = 1.2
5. To calculate the diameter:—

$$\frac{V}{ND} = 1.2$$

$$D = \frac{V}{(N)\ 1.2} = \frac{278.5}{42.8 \times 12} =$$

5.42 feet = 65″.

APPENDIX II

Drag Estimates and Horsepower Data

Drag Estimates

Wing:—1. Read C_d drag coefficient from Fig. 3, minimum value is .0066.

2. Calculate induced drag coefficient from

$$C_{d_L} = \frac{C_L^2}{\pi AR} \text{ where } \begin{array}{l} C_L \text{ is lift coefficient} \\ AR \text{ is aspect ratio} \end{array}$$

This value added to item 1 gave a coefficient for whole wing of .00744 at 1.3° angle of attack.

Fuselage—From (1), Page AO:40, assume fuselage drag of 2.7 lbs. per square foot of cross section; this gives $2.7 \times 7.00 =$ 18.9 lbs. at 100 m.p.h.

Landing Gear—From (18), Fig. 10, drag of each wheel and strut is 2.08 lbs.; for both wheels, drag is $2.08 \times 2 = 4.16$ lbs. at 100 m.p.h.

Empennage—The tail airfoil section is tapered from a N.A.C.A. .0009 at root to a N.A.C.A. .0006 at tip. From (15) the drag coefficients of these sections were determined. With due allowance for the low aspect ratio and taper of the tail surfaces, the minimum C_d is taken as .0064.

The actual drag is calculated from the formula $D = \frac{1}{2}\ SC_dV^2$ where:—

D = Drag in lbs.
S = Area in sq. ft.
C_d = Drag coefficient.
V = Velocity in ft./sec.

Using the information on the previous page and the method completely described in (3), Page 242, a series of values are obtained for the horsepower required at specific airspeeds. The lower curve on Fig. 5 was plotted from these values.

For a check on the accuracy of the drag calculations the following is a list of the equivalent flat plate area of known aeroplanes (taken from (4)).

	sq. ft.
Keith-Ryder Racer	1.21
Lockheed Orion	1.63
Gee-Bee Racer	1.75
(This racer is	1.34)

Appendix II is continued on page 558.

Calculations for Horsepower Available

Using method in ② Page 196, Table IX

1	2	3	4	5	6	7	8	9	10
V m.p.h.	o/o Design V	o/o Design N	N r.p.m.	Brake h.p.	$\frac{V}{ND}$	o/o Design V/ND	o/o Max. η	η	h.p. available
60	31.5	87.0	2235	73.9	0.44	36.7	43.0	0.369	27.3
80	42.1	87.0	2235	73.9	0.58	48.3	58.5	0.503	37.2
100	52.6	87.5	2250	74.3	0.72	60.0	71.5	0.615	45.7
120	63.1	88.0	2260	75.4	0.86	71.6	83.0	0.713	53.7
140	73.6	91.0	2340	77.3	0.96	80.8	91.0	0.782	60.5
160	84.2	94.0	2420	79.9	1.07	89.1	97.0	0.834	66.6
180	94.7	97.0	2490	82.8	1.18	98.4	99.3	0.857	70.9
190	100.0	100.0	2570	85.0	1.20	100.0	100.0	0.860	73.1

The values in Column 10 give the horsepower available curve on Fig. 5.

■ ■ ■

A UNIQUE STABILIZATION JOB

At Binghamton, N.Y., the Department of Public Works of New York State, recently completed a significant experiment in stabilizing a dump fill with a Bros 50-ton pneumatic tired roller with oscillating wheels. The following is digested from a preliminary report of George W. McAlpin, chief soils engineer.

The dump was on the line of an arterial highway system running through the city of Binghamton. It varied in age from 6 months to 15 years. The fill material varied from 5 to 20 feet in depth, and was composed of the usual dump refuse . . . paper, rags, wood, glass, ashes, cans, metal, old tires. Previously the area was a meandering creek in low flat lands and the material underlying the fill consisted of unconsolidated organic silt and clay.

Excavation of unsuitable material and backfilling with acceptable borrow was ruled out as too expensive because of the large quantities involved, the long hauls to dispose of waste, and the sanitary problem of moving waste through the city. It was therefore decided to compact the material in place with a super-heavy compactor, to give it a uniform bearing value capable of supporting the intended arterial highway fill.

Compacting at Various Weights

Two compaction tests were conducted on seven test sections. These sections were 200 feet long by 20 feet wide and laid out in various locations of the dump so that fills of different ages and composition would be included. Progressive elevation profiles were taken to measure the amount of compression or displacement.

On the first 5 sections the compaction tests were made in three separate stages. In the first stage the Compactor was used empty, weighing twelve tons. Twelve full passes were made. Next the same areas were re-rolled — twelve full passes with the Compactor loaded to 31 tons.

In the final stage, with the Compactor at its full capacity of 50 tons, the areas were rolled until no measurable settlement was noticed. ing these tests into which the compactor sank as much as four feet. These areas were filled and levelled off with a thin layer of gravel before rolling was resumed.

In the second test the Compactor was used at its full 50 ton capacity and the last two strips compacted.

The objective of these two tests was to compare the action of the Compactor fully loaded *on material not previously compacted*, to the action on material *previously compacted by light rolling;* and to record and compare the number and depth of local depressions in the two methods.

It was the general opinion of observers that a more satisfactory construction practice could be developed if the sections were rolled several passes with the Compactor loaded to 30 tons, followed by levelling of local depressions with sand and gravel, and then re-rolling to completion with the Compactor loaded to 50 tons.

As the test rolling progressed it became evident that once the local weak spots were levelled with a layer of sand and gravel, and these spots properly compacted, the sections became sufficiently strong to stand additional passes of the Compactor loaded to 50 tons, without any further measurable settlement except for some minor weaving under the pneumatic tires.

The average amount of settlement measured was approximately 1.5 feet with some maximum depressions up to 4 feet deep in localized areas. In general, there appeared to be an increase in the density of the fill to a depth of approximately 4 to 5 feet.

A D-7 Caterpillar Tractor was used to pull the Compactor empty, and an HD-19 Allis Chalmers when the Compactor was one-half and fully loaded. This power was adequate except where the Compactor became mired in weak spots where foundation material did not give sufficient traction. In such cases a combination of the two power units worked satisfactorily.

Mr. McAlpin concluded his report with the statement that "the experiment was made to determine the feasibility of such a method of construction and that final decision and design are yet to be made".

EDMONTON'S UNDERGROUND SECONDARY NETWORK DISTRIBUTION

A paper presented before the Edmonton Branch of The Engineering Institute of Canada on February 2nd, 1949

by

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and

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Discussing Edmonton's postwar need for expanding its electrical service, this paper outlines the basic principles of low voltage network distribution, and describes the choice and design of equipment, manholes, vaults, ducts, connections, ring buses and limiters installed.

Installation of consumer services is discussed, as well as methods employed in pulling cables, placing transformers, connecting up and energizing the network. Some observations are added as to troubles experienced in network operation.

During the war years, extensions and expansion of electric services were curtailed by government regulations to only the bare essentials necessary to the war effort. With the end of the war came the post-war boom, with electrical demands increasing by leaps and bounds, causing substations, high tension and low tension feeders to build up rapidly to their capacity. As a result new stations and feeders had to be installed as rapidly as possible to keep ahead of the growing load.

One area of Edmonton which required particular attention was the central business section of the city, defined generally by 100 Ave. on the south, 104 Ave. on the north, 97 St. on the east and 109 St. on the west. This particular area was fed by six, 1200-k.v.a., 2300-volt feeders, all of which were getting dangerously close to full load at the end of the war. Substation capacity supplying these feeders was taxed to capacity, and congestion in this area forestalled the possibility of installing new substations.

Along with increased electrical loads, the post-war era also brought a tremendous increase in Edmonton's traffic. The twenty-foot lanes through which utility services are run are restricted in their use to traffic by pole lines, which project over 4 feet into the lanes. It became obvious that the programme of reconstruction in this area should also initiate a programme of pole removal from the lanes; in other words an underground distribution system would be desirable.

A thorough analysis of several types of distribution was made, from the viewpoints of initial cost, ease of extensions and load additions, continuity of service, traffic conditions and cost of maintenance. This study indicated that the best, and in the long run most economical, type of distribution for this heavy load density area would be an underground network system. Such a system would consist of 13800-volt primary feeders, and 120/208-volt 3-phase 4-wire secondary distribution feeders. This low voltage network system would eliminate 2300-volt feeders from this area, thus releasing substation and feeder capacity for service elsewhere. This policy was initiated in the immediate post-war period, and actual construction of the network system was commenced in 1946.

Basic Principles of Low Voltage Network Distribution

The sketches shown in Figure 1 will illustrate the basic principles of the actual construction of the network. Figure 1 (a) shows a typical radial system such as the lines which formerly served this

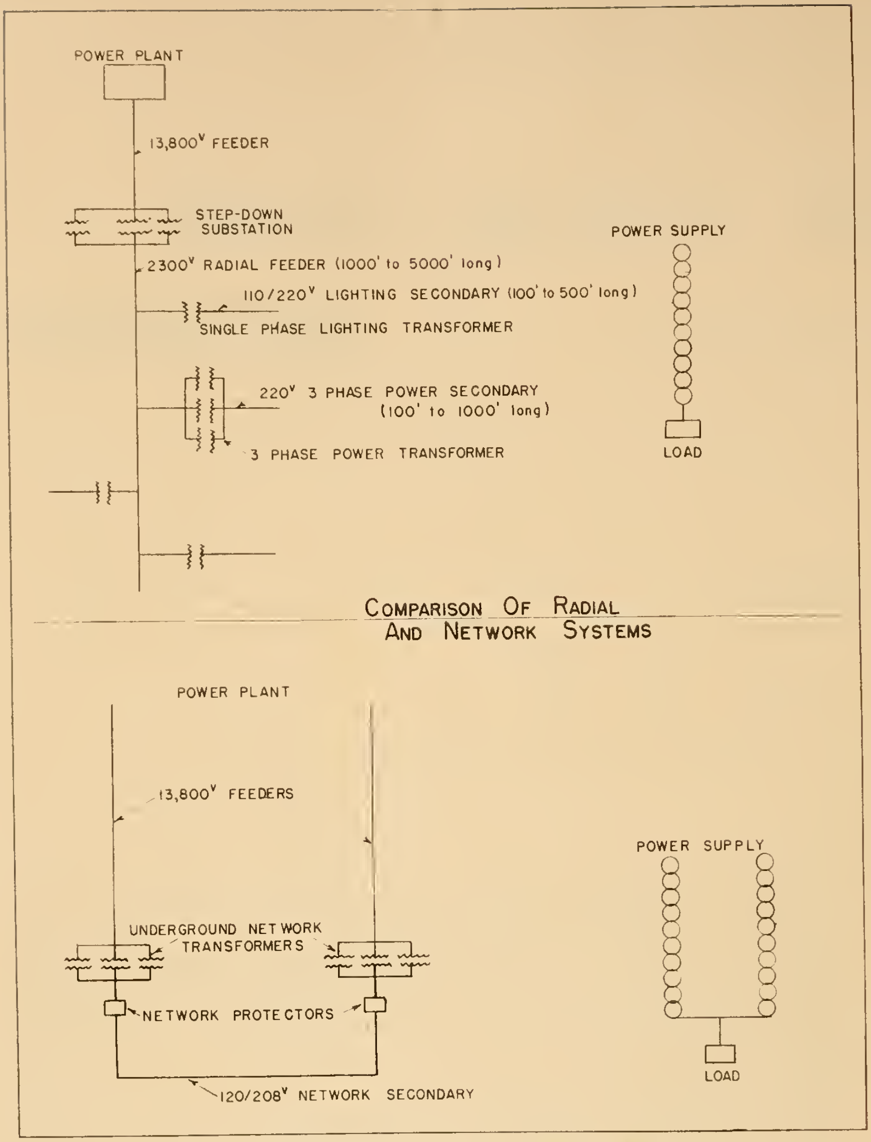


Fig. 1. Comparison of radial and network systems.

area. The various components of a radial system fit together like the links of a chain, where the usefulness is dependent on the operation of each link. If the 13800-v. feeder or substation transformer should fail, service to all customers on the system will be interrupted until repairs are effected. Should the main 2300-v. feeder become faulty, again all service will be disrupted until it is repaired. If a lighting or a power transformer should fail, again those customers taking service from these transformers will suffer an interruption to service.

Since power is fed into the 2300-v. feeder at only one point, customers near this point will get the highest voltage, while customers on the tail end of the circuit will get a lower voltage, determined by the size of copper in the feeder, length of line, and load on the line. Since lighting and power secondaries are fed from separate transformers, service lines to buildings for lighting and power must be kept distinct. Two sets of wiring must be installed in buildings in order to get both single-phase and 3-phase service.

Figure 1 (b) shows a simple type of network, often called a spot network. Two links in the chain are missing—the substation transformer and the 2300-v. feeders. We have now two 13800-v. feeders each supplying a network transformer located near the load. This is like a double chain, and it can readily be seen that if one chain should break, the other chain automatically carries the load. In the network, should one feeder or transformer fail, the network protector on the faulty section immediately opens thus isolating that section, and transfers all the load to the remaining feeder and transformer. From the sketch it is also seen that elimination of 2300-v. feeders has eliminated one source of voltage drop. Since secondaries are fed from each end, at normal operation, voltage drop on the secondary lines is also reduced. Since several cables are installed in parallel on the secondaries, the failure of one cable will transfer the load to cables which are still in service. Thus it can be seen that service reliability on the network is at an optimum.

The secondaries of the network feed both lighting and power loads over 4 wires, giving 120-v. phase to neutral for lighting service, and 208-v. 3-phase for power loads. Thus it can be seen that only one wiring system is required in a building for both lighting and power, resulting in an appreciable saving in the cost of wiring buildings.

The spot network may now be expanded to a larger number of transformers as shown on Figure 2. This plan represents the network as it is operating at present. The transformers on each feeder are interlaced, so that if one feeder should be taken out of service the remaining transformers are placed strategically around the network, to keep the length of secondaries between transformers to a minimum. The pattern could not be made perfectly balanced, due to the geography of the area as shown on Figure 3, but this was taken care of in the design of the secondaries in this section. Transformer capacity is 3500 k.v.a. and peak load in the area is approximately 1800 k.v.a. at present. Thus if one feeder should fail, the other feeder can carry full load without overloading the remaining part of the system. Secondaries were designed to give a maximum voltage drop of 2 per cent.

As the network expands it is intended to install a 3rd high tension feeder, and the ideal pattern that is aimed for will be that shown on the Figure 4. This sketch shows how the transformers on the different feeders are interlaced around the secondary grid. When this is achieved, the failure of one feeder will remove only 1/3 of the transformers from service, so that the whole system can be designed for 1/3 spare transformer capacity, instead of ½ as in the case of 2 high voltage feeders. This results in a considerable saving in transformer capacity required, and will have the effect of increasing the capacity of the present section to care for future load growth.

The pattern of the network system is such that load growth is very easily taken care of. If the load in any one section should increase beyond the present installed capacity, it is quite a simple matter to install an additional transformer wherever the load requires it. The improved voltage regulation of a network results in a more uniform service to lamps, thus increasing light output and efficiency. The voltage supplied to power loads is high enough for the satisfactory operation of 220-volt motors.

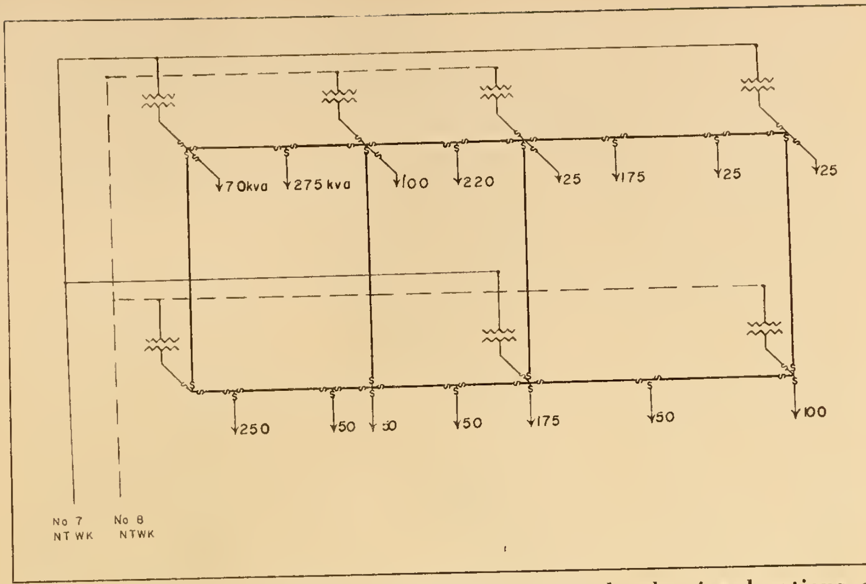


Fig. 2. Schematic drawing of underground network, showing locations of limiters and size of loads.

Design of and Choice of Network Equipment

A preliminary plan was laid out as shown on Figure 3, with the transformer locations as shown. This area urgently required relief, and so it was decided to begin the network in this section. The approximate load centres and sizes of loads were marked on the plan, and the proposed arrangements were put on a d-c calculating board. From this, information was gained as to how the load currents would divide through the different sections, what the voltage drops would be, resulting from the use of certain numbers of cables in all faulted sections. This report formed the basis of our network system.

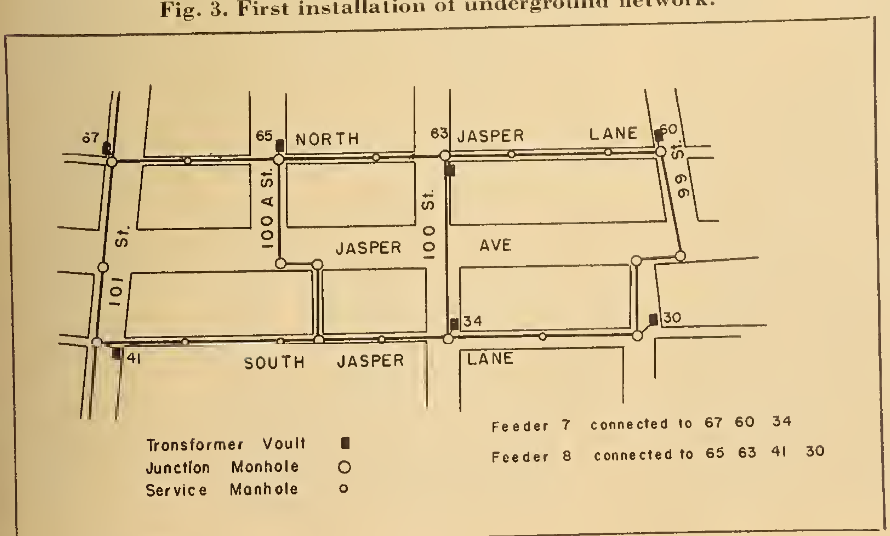
The standard network transformer consists of a high tension disconnect and grounding switch, with suitable pothead for cable entrance, and a 3-phase 13800/120-208-v. subway type transformer, and a low voltage network protector. The size of transformer was determined by size of load to be served and the locations available for installing network vaults. The 500-k.v.a. transformer was chosen to fill requirements to the best advantage.

The high tension disconnect switch is not intended to be operated as a load break switch, and has an interlock device, which prevents it from being opened when the transformer is energized. The grounding part of the switch is a safety device which may be used by repairmen working on the high-tension feeder to insure that it is de-energized. The transformer is connected delta primary and wye secondary, with neutral grounded to the case.

The low voltage network protector is the heart of the network system, (Figure 5). It consists of an air circuit breaker and associated relays which will isolate the transformer from the network when conditions require it, and will reclose the transformer to the network when conditions are proper to do so.

The relays of the network protector will open the protector on reverse current caused by a fault in the transformer or high voltage feeder, and on transformer exciting current when the high-tension feeder is opened at the power-plant. The relays will close the protector when transformer voltage is at least 1½-v. higher than the network voltage, and is in phase with the network voltage. In this way, a transformer which is accidently cross-phased can not be closed in on the network.

Fig. 3. First installation of underground network.



Vaults, Manholes and Ducts

With the preliminary plans of the system completed, the next step in the programme was the design of equipment, manholes, vaults and ducts. Three ducts were required for network secondaries; 3 ducts for primaries, and possibly one for street-lighting, making a total of 7 ducts. It was therefore decided to build a bank of 9 ducts throughout the network

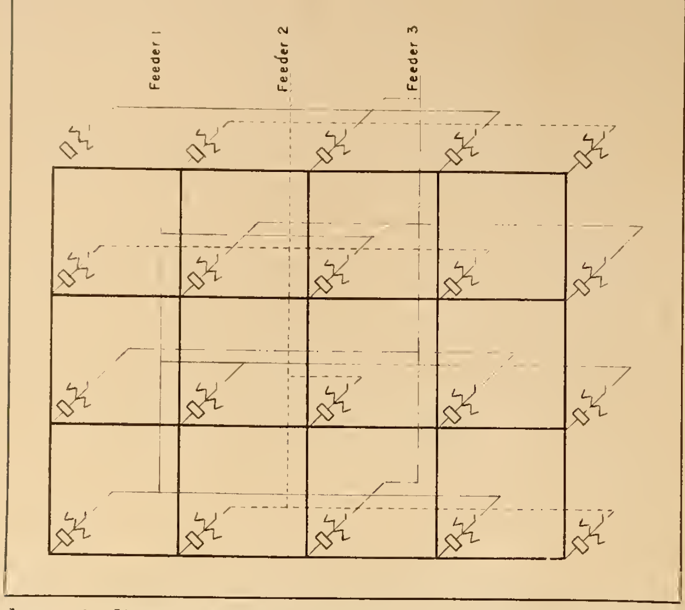


Fig. 4. Schematic diagram showing the basic arrangement of primary feeders, network transformers, and secondary mains in a low voltage secondary network.

area the ducts being laid 3 wide and 3 high.

The manholes previously used for cable splicing manholes were chosen as being suitable for junction manholes, where secondary mains and transformer feeds were joined together. The question of underground services to buildings was then studied, and it was found preferable to run conduit directly from manholes to buildings, and install service cable in the conduits. In order to reduce the length of service pipe required to reach buildings in the middle of a block, manholes were spaced a maximum of 200 feet apart, thus limiting the longest service to 100 feet. This required that additional manholes be installed in the lanes, between street intersections.

In order that the lanes not be obstructed for use by other utilities, manholes of rectangular plan were designed for service manholes. Later experience with the network cables showed that these manholes were too small to handle the number of secondary cables required in some sections. Slightly larger manholes with smaller entrance covers were therefore built, which will facilitate the training of secondary main and service cables to the ring bus. This new design will be used for all future service manholes.

The transformer vaults previously used had inadequate ventilation, so a new vault had to be

Fig. 5. Network protector.

Fig. 6. Limiter taps.

designed. This had an elaborate ventilating system, which made the depth to the bottom of the vault nearly 12 feet, so that cases arose where it was difficult to obtain proper sewer drainage. In the last three vaults built, this defect was remedied by eliminating the part of the air shaft below the floor level, and allowing the cold air to enter the vault through a screen in the lower part of the entrance shaft. This made the depth of the vault about ten (10) feet.

Another weakness that has appeared in the vault has recently been discovered during freezing weather. Ice becomes wedged between the doors of the removable slabs on the roof of the vault, making removal of the doors extremely difficult. At present another change in the vault is planned, which will overcome the difficulty. The steel frames of the vault roof and doors will be made to bevel in slightly from topside to underside. When this is done, a jack may be used to break the ice seal, and the doors will no longer have a tendency to wedge against the roof frame.

The next item considered was the choice of low voltage cables to be used. There were many alternatives available, among them being lead covered asbestos-insulated cable as used in the Toronto network, lead covered paper-insulated cable as used in Calgary, and neoprene-insulated cable as used by some of the American cities in recent years. A study of the properties of neoprene cable and lead-covered cable, the first cost of each, ease of pulling into ducts, and problems of splicing, showed a very definite advantage to the neoprene jacketed cable. The size of cable was determined by a comparison of current carrying capacity and costs of several sizes, and the burn-off characteristics. The choice fell to a composite cable, which had been used previously by the New York Edison Company in New York City.

Edmonton is the first city in Canada to use this neoprene cable for underground distribution. It consists of six No. 4/0 neoprene jacketed conductors, cabled around a 450,000-circular mil bare neutral. The size of neutral was determined partly by the size of core required by six No. 4/0 conductors. Each No. 4/0 conductor is covered with 5/64 versatol insulation and a 3/64 neoprene jacket.

In order to simplify transformer connections, four 500,000-cir. mil neoprene jacketed cables per phase are used to connect the transformers to the secondary mains. Performance of this cable so far has been good. The six-conductor cable is conservatively rated at 125 k.v.a. carrying capacity, and in the network, 3 such cables in parallel are used to carry full transformer load.

The choice of 13800-v. cable was determined by the load of the ultimate network, number of feeders to be installed, and geographic location of the transformers. The design led to the use of paper insulated lead covered 15000-volt cable. The main feeders from the power plant are 250,000-cir. mils, and all branch feeders to the transformers are No. 2.

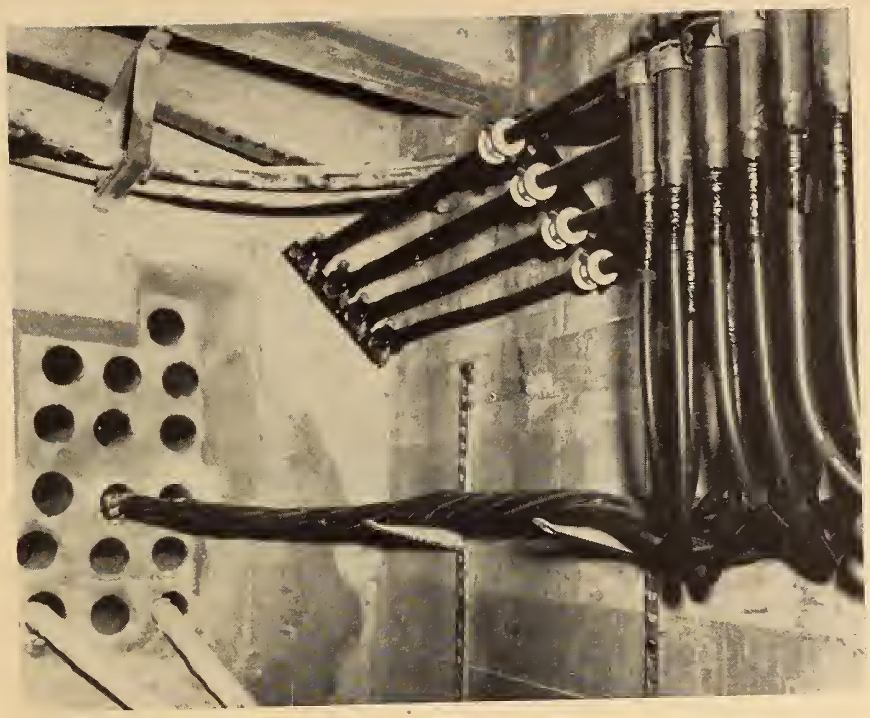


Fig. 7. Typical service manhole installation with secondary mains.

Ring Buses and Limiters

After the selection of the size, type and number of secondary cables had been made, the problem arose of connecting these cables together at the junctions and service manholes. There were two general methods used in other networks—the ring bus, and the pre-insulated multiple connector. From the economical as well as the practical standpoint, it was found that the ring bus would prove to be the best method for terminating cables and tapping off services. Since it was to be a three-phase four-wire system, four buses were required each to consist of one 500,000-cir. mils neoprene covered cable. Four hole cable brackets were used for mounting the ring bus to the ceiling of the manhole. In the service manhole the buses were installed in the roof from one wall to the other and not in a ring.

To clear secondary cables which may have become faulty, two methods are used in this system. In the first method, limiters are used to connect secondary cables to ring buses, and transformer feeds to ring buses. In the second method, transformer feeds are connected solidly to the network protector, and depend on the network transformer to supply sufficient current to burn clear any cable that should become faulty. (Fig. 2.)

To terminate the secondary cables to the bus required a type of a T-connector, and since limiters were to be used, the limiter tap was found to be the most suitable. (Fig. 6) This tap is fastened to the bus by means of a mechanical bolted connection, and is secured to the tap off lead by means of indents made by a pressure tool called the Hypress. Some consideration was given to using the replaceable link limiter. It was considered, however, that the frequency of replacing limiters would not warrant the extra expense of using the replaceable type. Two

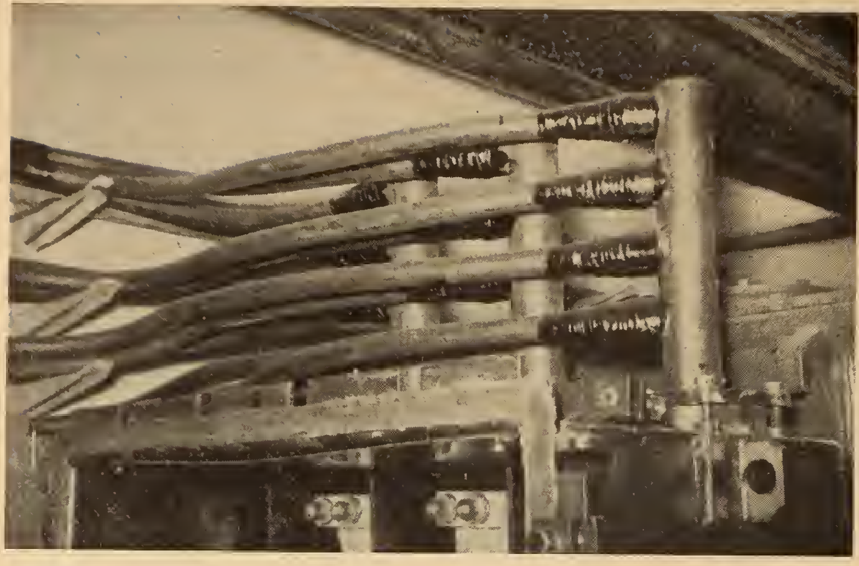


Fig. 8. Stud moles mounted on top of protector.

sizes of limiter taps were required, one with 500,000-cir. mils run and tap for secondaries from transformer to the bus, the other with 500,000-cir. mils run and No. 4/0 tap for secondary mains. No limiter is required on the neutral, so an ordinary T-tap was used for connecting the 450,000-cir. mils bare neutral to the ring bus.

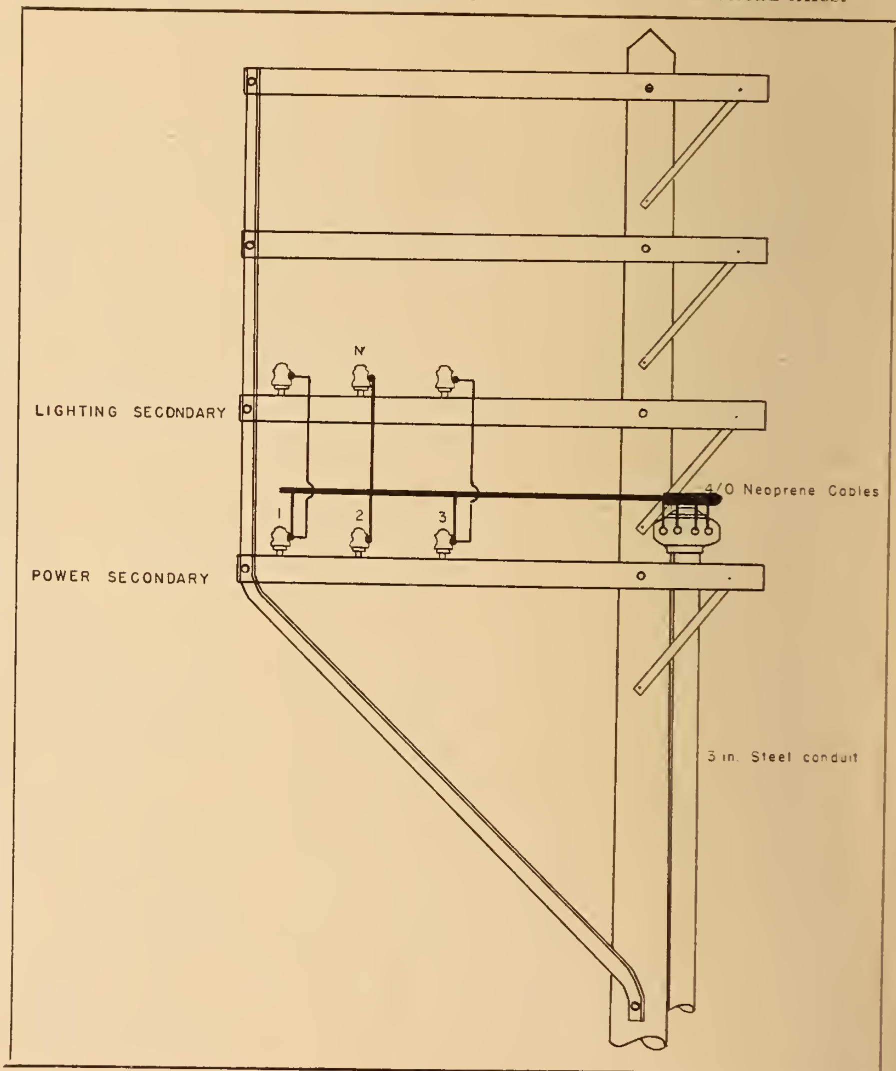
The limiter consists of a restricted copper section, with a fusing characteristic such that it will blow before cable insulation should become damaged. The report from the d-c Calculating Board showed the short-circuit current available on the various parts of the network, and recommended the use of limiters in certain sections in order to insure the clearance of faulted cables. In the design of the network limiters were uniformly used throughout the network, with the one exception previously mentioned. This was done in order to reduce the number of secondary cables required in parallel in some sections, and also with a view to limiting cable damage on short-circuit as much as possible.

Consumer Services

At the time of the installation of the network, services to buildings were mainly overhead connections. Those that were underground were consumers receiving service at 2300 volts, and their service consisted of an armoured cable down the pole and into the building. These consumers would eventually have to go on the network, and therefore provision had to be made for a new underground service to these buildings. While constructing the ducts for the network services were run to all large buildings in this area, and provision made for services to places where new buildings were anticipated. These underground services consisted of a 4-in. fibre conduit from the closest service or junction manhole along the main duct lines, and then a 4-in. steel conduit across the lane into the building.

In all cases these services drained away from the buildings into our manholes. Depending on the size of the load, two or three conduits were run into the building. If the consumer's main breaker is located near the service entrance, then the cable is run directly from the bus bars in the manhole to the breaker. If however the consumer's breaker is at a distance from the service entrance, then a specially designed junction box has to be used. The cable is then run from our manhole to the junction box, and the consumer supplies and installs the cable from the

Fig. 9. Method of connecting underground network to overhead lines.



box to his main breaker. The junction box consists of four copper bus bars, one for the neutral which is mounted directly on the box frame, and three which are split in half so that the service can be fused. This fusing is intended as a protection on the cable and for disconnecting the consumer from our service and not as an overload protection.

Since there are many old buildings in this area to which underground services were not run, it will probably be a number of years before the whole area can be put completely underground. However, all new buildings in this area will have underground services, and existing consumers are being urged to change over as soon as possible.

Pulling in Secondary and Primary Cables

The seven-conductor neoprene-covered cable has an outside diameter of 2½ in., and this has to be pulled into a duct with an inside diameter of 4 in. It was not apparent how difficult it would be to pull this cable, so it was decided to pull the first shipment in the winter time, which was in January of 1948. The cable was first kept in the shop until it was quite warm. It was then taken out and pulled into the ducts in below zero temperatures. It was harder to pull than the customary lead covered cables, but still not too difficult. The remainder of this cable was pulled into ducts the following summer, and it was found that by applying soapstone to the cable as it entered the duct mouth, the pulling strain was considerably eased.

There are two ways for connecting the pulling apparatus to the cable. A grip can be used which fits over the sheath of the cable. This is generally used for short pulls, or for longer pulls of smaller sized cables. Another method is to attach a pulling eye to the end of the cable. This method was used in pulling the neoprene cable, and it is the best method, since it will not damage the cable sheath or covering. The longest length to be pulled off this cable was 538 feet, and this was pulled in a straight run.

Placing Transformers in Vaults

The transformer vault has three removable slabs in the roof. With these removed, the opening is large enough so that a network transformer complete with high voltage switch and protector can be lowered into the vault. However, since the protector contains delicate relays, it was decided to lower the protector into the vault first, then to lower the transformer. The protector would then be assembled onto the transformer in the vault.

The transformer complete with switch and protector weighs about 5 tons. The first transformers were lowered into the vaults in April, 1948 without any difficulty. The transformers were set in the vaults with the protector end facing the entrance ladder of the vaults. In this position the protector is more accessible than the high voltage switch, and since it requires more attention this arrangement is preferred.

Connecting Up the Network

The high voltage side of the network was connected up first. The primary cables were spliced through from the power plant to the network. The connection of the primary feeder to the transformer is made through a pothead, connected to a terminal chamber which is located at the top of the disconnecting and grounding switch. This chamber provides a means of connecting the high voltage cables to the switch, then through the switch to the transformer winding. Such an arrangement makes it unnecessary to open the switch compartment when connecting the feeder cables to the transformer, and avoids the necessity of draining the oil from the switch compartment. When the work of cabling is completed, a cover plate is replaced over the front of the chamber and sealed with gaskets, and the entire compartment and pothead is filled with compound. Since it will be necessary to change the primary feeders on some transformers when the third feeder is installed, the compound used was one that would not jell too hard, and consequently would be easier to remove.

To make certain that cross phasing did not take place in the high voltage cables, each phase of the cable was traced from the power plant to each transformer. The bus at the power plant marked 'phase 1' was connected to H1 of the network transformers phase 2 to H2 and phase 3 to H3. Two way, three way and four way splices had to be made on the high voltage cables of the network.

The first step in the secondary part of the network was the installation of all the buses. In the manholes these buses were originally placed in the ceilings, in later work this procedure was changed, by putting the buses at an angle part way in the ceiling, and part way in the wall. The secondary cable was then connected up, making sure that the phases were correct. When all the secondary cables had been connected up each phase was meggered, to insure that no cross phasing had taken place. The buses in the junction manholes were numbered phase 1, 2, 3 and neutral, from the entrance of the manhole to the wall. The buses in the service manholes were numbered in a similar manner. Figure 7 shows a typical service manhole installation with secondary mains.

The connection from the transformer to the secondary mains was made through studs mounted on top of the protector. These studs are actually Burndy Moles, to which the secondary cable is connected by means of a mechanical connection. (Fig. 8)

Relays

On the network protector (Fig. 5) there is an air valve, used for testing the protector after testing relays is completed. The relays are first tested in the shop for proper settings, then the whole protector is tested in the field after the network is energized. After this test the protector is sealed and inflated with air to 6 lb. per sq. inch, and left for 24 hours. If the pressure drop is less than 2 lb., the protector is left in operation, if the pressure drop is more than 2 lb. the protector is investigated for leaks and these are sealed.

The underground secondary mains had to be tied to the overhead existing lines. This was done by running four No. 4/0 neoprene cables through a 4-in. conduit from junction manholes to the nearest pole. These cables were phased and tagged at the top of the pole, so that correct phasing would be obtained when the overhead lines were connected to the underground.

Transition from Radial to Network

The first step in energizing the network was to open the high voltage switch and the network protector on all the transformers. The breaker of feeder No. 7 was then closed in at the power plant, this was on Sept. 13, 1948. Feeder No. 8 breaker at the power plant was closed in next, and the network was energized by closing the high voltage switch and the protector on the transformer at 99 St. and north Jasper lane. With the secondary mains energized the field test was carried out on all protectors. The network was now ready for connecting up to the overhead system, which would transfer the load from the existing lines to the network.

On the aerial system the power secondary and the lighting secondary were on poles as shown in Fig. 9. The proposed plan was to use the existing lighting neutral for the network neutral, and to tie phase 1 of the power to one leg of the lighting, and phase 3 to the other leg. This left phase 2 with only one conductor, however it was considered sufficient to carry the load. The load on the overhead lines would be decreasing rather than increasing and any additional outlay for the overhead lines would be uneconomical.

The network was changed over one block at a time. The existing phase rotation on the three phase power secondary was checked, so that with the change-over the motors in this area would still rotate in the same direction. The three phase power load in the south Jasper lane was changed over to the network operation on Sept. 14, 1948; in the north Jasper lane on Sept. 16. This was a comparatively easy task, since no balancing was required. The transfer of the lighting load took a little more time, because of the balancing required to bring the lighting service across the three phases, rather than just two as they would be if left alone. The existing distribution transformers were first disconnected, then jumpers were installed from the power wires to the lighting wires as shown in Fig. 9. The lighting load in the south Jasper lane was transferred to the network on Sept. 26 and in the north Jasper lane on Oct. 17, 1948. This completed the transfer of all the loads to the network, and all that remained was to balance the lighting loads. This was done by balancing services and later checking with actual readings and making any changes required.

Network in Operation

The operation of the network is quite simple. Both primary feeders are kept in service at all times, so that if a fault occurs in one feeder the other will maintain continuity of service. When the third feeder is installed we will be able to cut one feeder off on light load periods, such as at nights and on Sundays and holidays.

Maintenance consists of inspecting all transformers monthly, noting transformer temperature and recording protector counter. Load readings on all junction points and on transformers are taken monthly. This is the only way we can tell if any of the limiters have gone, or if any of the cables are overloaded. Our plan is to inspect and check all relays yearly and to overhaul all protectors every two years.

To date we have had only two cases of trouble develop in the network. On Oct. 2, just after the network was put into operation, one of the 500 k.v.a. transformers had to be taken out of service. This happened on a Saturday morning, and since no service interruption occurred would have gone unnoticed, except that a storekeeper next to one of our vaults noticed smoke coming out of the ventilating grate of the vault. Our troubleman was immediately notified, and he found that the protector had tripped open as it should, but the breaker at the power plant did not open. The explosion vent of the transformer was shattered, and this was the only visible sign of trouble. This transformer was shipped back to the factory and was found to have a fault in the primary windings.

The only other trouble we have encountered occurred recently when one of the protectors would not close back in, after the power plant breaker was opened on that particular feeder. This was a burned out closing motor on the protector and was immediately replaced. We have had no trouble as yet on secondary cables, and consequently no limiters have blown.

Little trouble has been experienced due to use of 208 volts for three phase service in place of the standard 220 volts. A few of the elevators were slowed down slightly, but this was remedied by changing their control settings. Some of the theatres use three phase power to supply their rectifiers operating arc lamps on the projectors. The lower voltage caused a little inconvenience until the taps on the rectifier transformers were changed.

Some trouble has been experienced with large buildings, that used to be on the three wire 110/220 volt service, and are now fed 120/208 volts two phase. The voltage at the receiving end of this service is usually unbalanced, due to the fact that a current is always flowing in the neutral conductor, which is the vector sum of the phase currents. This neutral current causes a drop in the neutral conductor, and consequently shifts the neutral point. This voltage change varies with load and conductor size, and is therefore a difficult problem to overcome. Wherever possible, therefore, buildings should be wired for a three phase, four wire distribution layout, especially if the building is to have a large load. One building in particular was having voltage troubles on upper floors previous to network installation, due to overloaded circuits in the building. Network installation aggravated the situation slightly. However the building management has welcomed the opportunity of relieving the overloaded building circuits by splitting the load across three phase wires, at a much lower cost to him than would have been the case with the former single phase radial system.

Notes on Management

The Role of the University in Industrial Relations

Lloyd G. Reynolds

Editor's Note:

In April of this year Dr. Reynolds delivered the principal address at an Industrial Relations Conference sponsored by McGill University in Montreal. *The Journal* presents in this month's Management Notes an abridgement of Dr. Reynolds' remarks.

One's ideas about the contribution which a university can make with respect to industrial relations necessarily depend on what one thinks industrial relations is about. I want to begin, therefore, with a few remarks on the nature of the subject with which we are dealing.

In recent decades, the nature of industrial relations has been gradually transformed by the growth of union organization.

It is not the purpose of this paper to discuss the advantages and disadvantages of collective bargaining; nor to examine the forces responsible for the growth of unionism. Suffice it to say that these forces are very deep-rooted and that the growth of unionism appears—under democratic conditions, at least—to be an inexorable and irreversible process. In some of the older industrial countries of the world, the proportion of workers who are in trade unions is approaching 100 per cent. In the United States the proportion is still only about 50 per cent, and I should judge that in Canada the proportion is somewhat smaller. There can be no doubt, however, about the long-run tendency. Looking ahead ten or twenty years, one must contemplate a situation in which collective bargaining will be the predominant way of determining wages and conditions of employment.

Under collective bargaining, personnel policies take on quite different significance. Concerning any proposed policy, one has to ask not merely, "Will it contribute to the efficiency of the enterprise?" but also, "Can the workers and their union representatives be persuaded to accept it?" A policy which cannot be "sold" to workers and union leaders is of no practical importance. The engineering logic, which dominated the scientific management movement in its earlier stages, must accommodate itself to the logic of human relations.

When one asks what are the pre-requisites for successful union-management relations over the long run, one can get, I suppose, about as many opinions as there are students of the subject. I would be inclined to stress two things in particular. First, each side must be willing to accept the right of the other to survive. If management is out to "get the union", or if the union is out to overturn management, it is impossible to have anything better than an armed truce. Stable relations require not merely an attitude of general goodwill, but an intelligent appreciation by the men on each side of the basic objectives of those on the other side, and toleration, if not complete acceptance, of those objectives. The union must understand the economic limitations within which management operates—for example, the fact that an enterprise cannot survive in a competitive world without a reasonable level of productive efficiency. Management must understand that union leaders are under continuous political pressure to satisfy the wishes of the membership, under the penalty of becoming ex-union leaders

From an administrative standpoint, the problem is to integrate the union into the social structure of the enterprise so that it plays a definite and positive role, so that it becomes a participant in management rather than an outside critic. The alternative policy, still followed by some managements, is to maintain an arms-length relationship, to try to keep the union out of as many things as possible. I suggest that this strategy cannot succeed over any long period of time. Pressure from the union membership forces union officials to make demands on any subject which intimately concerns the welfare of the men in the plant. It is futile for management to reiterate "that is a matter for us to decide", — "we will not bargain about that issue",—and so on. If the workers are sufficiently concerned over an issue, it is going to be bargained about sooner or later. Management would be well-advised to recognize this fact at the outset. By conceding union participation in all matters of mutual concern, it may be able in return to secure increased union cooperation in the successful operation of the enterprise. The objective should be a situation in which both union and management officials think in terms of *functions* and *responsibilities*, rather than in terms of *rights* and *privileges*.

A view which regards industrial relations as synonymous with union-management relations, however, is still incomplete. What we really have is a three-way relation between union, management, and workers. Management is obliged to cater to the desires of its workers, if only for the practical reason that it must recruit and retain an adequate labour force. Most managements have a genuine desire to go farther than this and to do whatever they can to provide satisfactory jobs for the workers in the plant. The union organization rests even more completely on worker support. Unless the men in the plant believe that the union is helping them to get things which they want, and which they cannot get otherwise, the union will wither away. The workers are thus the basic raw material, and at the same time the ultimate customers, of both the union and management organizations. Industrial relations arrangements must be judged by the extent to which they meet the worker's standards of an adequate job and an adequate life.

To return now to the subject of this paper—the contribution which a university can make to the development of better industrial relations. I would like to address myself to two somewhat different questions. First, what can a university do for union and management leaders in solving their practical problems of dealing with each other? Second, what broader contribution can the university make toward furthering the public interest in sound industrial relations?

I do not think it is wise to exaggerate the direct contribution which we can make to the parties at interest. Practical skill in human relations comes very largely through experience, and I doubt whether it can be taught to people in any way. To some extent it is a matter of personal temperament and aptitude. Given a natural aptitude, skill is acquired through years of experience in negotiating with other people. I do not think either that it is the main business of a university to inculcate trade skills — to teach people how to write a water-tight seniority clause, or how to conduct a job evaluation survey. These things may need to be taught somewhere in the community, but they are scarcely at the university level.

A university should be concerned with the strategy of industrial relations rather than with immediate tactics. Let me illustrate this distinction by two examples. As you know, there are very elaborate techniques for making time studies of production operations, setting time standards, determining piece rates and constructing systems of incentive payment. The details of these procedures are matters of tactics. The interesting thing about incentive systems, however, is that they usually do not motivate workers to anything like the extent which an engineer or an economist might expect. Workers do not go out and overstrain themselves in order to make a little more money. They hold back on the job. The members of a work group tend to keep pace with each other in spite of marked differences in their natural speeds. Where there is a union in the plant, it will always insist on a voice in management's control of the incentive system. Why are these things true? Why do workers react to incentive systems as they do? Why are unions so concerned with controlling management's use of wage incentives? Is is possible to get agreement between unions and management on the structure and administration of incentive systems? These are strategic questions.

A second illustration is the increasing use in union contracts of so-called "managerial prerogative" clauses. These clauses are written in an effort to protect management's right to act without consulting with the union in certain areas of business operation. Some of them are very general, while others contain a detailed list of subjects which are to be within the sole authority of management and in which the union shall not interfere. From a tactical standpoint, one can examine the wording of these clauses from one contract to the next and try to find one set of words which seems better than another. The strategic issues, however, are why management feels as it does and what, if anything, can be done about it. Why does management fear union encroachment and feel it necessary to seek this type of contract clause? Is it feasible to give management the kind of protection which it is seeking? If so, can it be done through contract provisions, or is some other kind of arrangement necessary?

As soon as one tackles strategic questions of this sort, one realizes that we do not have a clear idea of the basic forces with which we are dealing in industrial relations.

We are not able to predict the effects of what we do because no one can tell how other people will react to our actions. The greatest contribution which a university can make at this stage is to develop principles of human behaviour which will improve our power of prediction in this area.

We need to know much more than we do about the objectives, attitudes, and habit patterns of industrial workers — what they want and how they go about getting it. It is fairly clear already that worker behaviour is not nearly so rational, individualistic, and economic as has sometimes been assumed. Workers do not react to a shop situation as individuals, but act rather in a manner approved by the group to which they belong. We do not know much about these behaviour patterns. Union leaders doubtless know more about them than either management or university people. It is very difficult, moreover, for a management to find out what is really on the minds of its employees. Workers are usually suspicious of questions put to them by management, and are unlikely to give frank answers. Surprisingly enough, they will usually talk rather freely to an outside interviewer from a university research bureau or some such organization. They will tell a complete stranger things which they would never want the foreman or anyone else in the plant to find out.

We need also to learn much more about the dynamics of union and management organizations. Union and management officials do not meet as individuals but as representatives of institutions whose interests they are bound to protect. When Mr. Smith, the vice-president in charge of industrial relations, sits down at the bargaining table he ceases to be merely Mr. Smith. He is a member of top management, pursuing objectives set for him by the board of directors and the chief officers of the company, and he is not free to depart from those objectives. The same thing is true of union officials. They must operate within the limits of what their members desire and believe possible. A union official who goes outside these limits will soon find himself out of a job. The fact that union and management people may be personally well-meaning and amiable does not have too much to do with the case. They operate within constraints imposed upon them by their respective organizations, and the real question is whether these institutional objectives are compatible. A great deal of friction in industrial relations results from the failure of the men on one side to understand and take account of the full context in which people on the other side are acting.

A major function of an institute of industrial relations should be to study problems of this sort. Such studies, of course, can be carried on only with the cooperation of business organizations which are willing to serve as laboratories. If university people fail to understand what goes on in industry, this is no doubt partly their own fault. Most of us in the universities have been too inclined to do book research, to sit in the library rather than to do the more difficult job of meeting and talking with people. Some of the fault, however, must lie at the door of people in industry. There is still a certain amount of secretiveness in industry, a desire to keep all information about the business within the company walls. This attitude is gradually breaking down, however, and more and more companies are opening their doors to serious students of industrial relations. I believe that this will yield large dividends to industry itself, both in terms of immediately applicable knowledge and in terms of a broader public understanding of industrial problems.

From Month to Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

The Toronto Subway Contract

Another conspicuous example of the Canadian dollars going to the United States has appeared in the letting of the contract for the first portion of the Toronto subway. The announcement was made through the press on July 8th. A syndicate of four contractors, one of which was Canadian, was the successful tenderer.

Sometime before the tenders were let, the president of the Engineering Institute sent a letter to the chairman of the Toronto Transportation Commission, urging that the work be given to Canadians. A similar letter was sent by the president of the Canadian Construction Association. Both letters argued that Canadian firms were competent to do the work and that Canadian money should be spent with Canadians.

The Institute has obtained some further information from which it is evident that Canadian contractors were not too keen on tendering. It looks as though the method of calling tenders had frightened some of them. To make up a price there was considerable engineering work to be done in advance. One contractor has stated "My estimate was that at least eight competent men would be required for the six or seven weeks of the tender call, to make the field surveys, the designs and the actual estimate of cost and that the expenditures would be from $5,000 to $10,000 in the doing of it".

It would seem only fair that unsuccessful tenderers should have some compensation for all that expenditure. Some firms did not bid because they did not wish to spend so much money on a chance that they would be low in a field that was open practically to the world.

Although the Toronto Transportation Commission is a publicly owned enterprise it does not follow the practice of most other such bodies in announcing the figures for all tenderers. Therefore, no one knows (or is not supposed to know) just how much higher Canadian firms were than the successful syndicate. Rumour has it that $800,000 separated the two lowest, the second one being Canadian. The contract price was "approximately $10,000,000". Is this too high a price to pay in order to use Canadian organizations and to keep Canadian money in Canada?

While examining this angle of the subject it is interesting to note an editorial in the *Financial Post* headed "Canadians Can Build It". Among other things it says, "Not by any means is it just a matter of dollars and cents. There is a challenge here to the Canadian engineering industry, an opportunity for Canadian engineers to show what they can do without leaving the country which provided their specialized and costly training. . . . In doing it ourselves we will be conserving for our own use two things we can ill afford to lose — foreign exchange and domestic ability".

The Commission seems satisfied that the award is an excellent one, and places emphasis on the fact that one member of the successful syndicate is Canadian. It is impossible for an outsider to know just how the work and the profits will be divided, but from looking up the records of all four firms it appears as if the Canadian organization would take but a minimum part. Their presence in the syndicate does not make it Canadian.

Perhaps if the whole story were known, the policy of the Commission would not be criticized in so many places, but in the absence of the details or an explanation, the decision is getting a lot of unfavourable comment, much of which is reported to Headquarters.

Since the above editorial was written, there has been some conversation and an exchange of correspondence with the assistant general manager of the T.T.C., from which it appears the Commission had every desire to use Canadian firms, but were unable to pay the price that such action would have required. The following letter was in reply to an inquiry from the Institute as to why the contract could not be let to Canadians. It reveals the position in which the Commission found itself.

No mention is made as to why another firm—wholly Canadian—which bid alone on one only of the two sections was not more fortunate. The rumour which comes to the *Journal* is that this firm was only $200,000 higher than the successful bidder for that portion of the work. Probably there are good reasons for letting both sections to the one contractor, but the Commission's rule of secrecy in these matters keeps the public from knowing what they are.—(Ed.)

Toronto Transportation Commission

August 24th, 1949

Dear Mr. Wright:

Re Yonge Street Subway

Thank you for your letter of the 15th instant regarding the recent contract awarded by the Commission for the first two sections of the Yonge Street subway, and advising that you had delayed replying to my letter of the 13th July until you had gathered enough information to reach some conclusions as to any action which the Institute might take.

I am rather at a loss to understand what you mean by "any action which the Institute might take".

As I explained to you in my earlier letter, with the exception of the Chicago firm of consulting engineers, all the office work and field work have been carried out by our own staff of Canadian engineers, assisted by the advice of N. D. Wilson, consulting engineer, Toronto, R. F. Legget, director of building research, National Research Council, Ottawa, and A. S. Mathers and J. B. Parkin, consultant architects.

No criticism can therefore be made by the Institute regarding our engineering policy on this project.

With regard to your comment that it was too bad that some of our fine Canadian firms which have the plant, the money and the personnel, could not have handled this Canadian project, the only Canadian contractor who figured on the whole job, without any American co-operation, submitted a figure over 60 per cent above the successful tender.

If the Commission had ruled that only a Canadian firm should carry out the work, then the cost for the first two sections would have exceeded sixteen million dollars, instead of ten million dollars, and the Commission could not have proceeded with the work at this high figure.

The very great bulk of the ten million dollars for the first two sections will be spent in Canada on labour and materials, and the only loss to Canada will be American interests in the profits.

In view of all the foregoing, I cannot see where the Institute has any ground for criticism of the Commission's action in awarding this contract.

With kind personal regards.

Yours very truly,

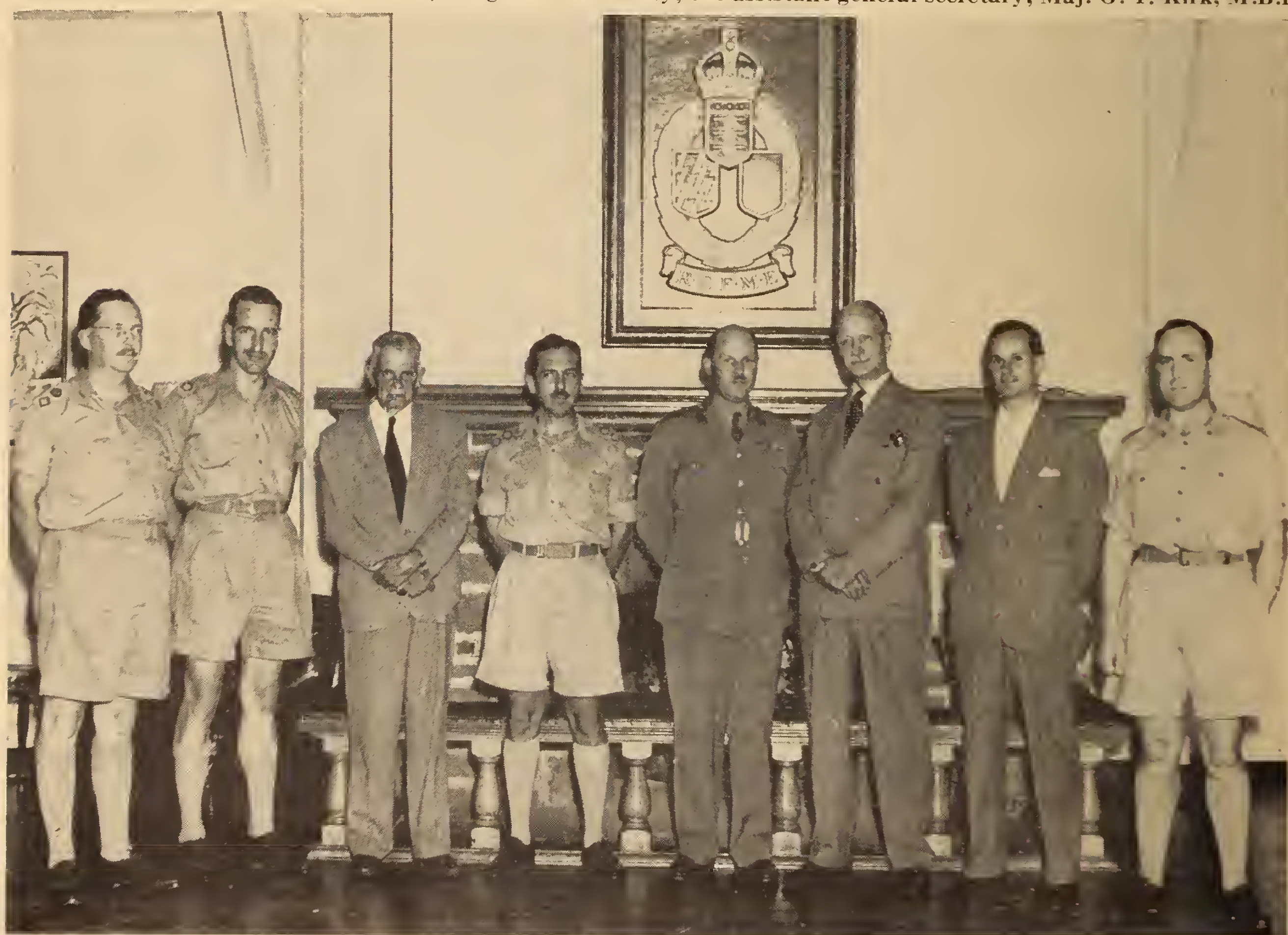
H. W. Tate, M.E.I.C.

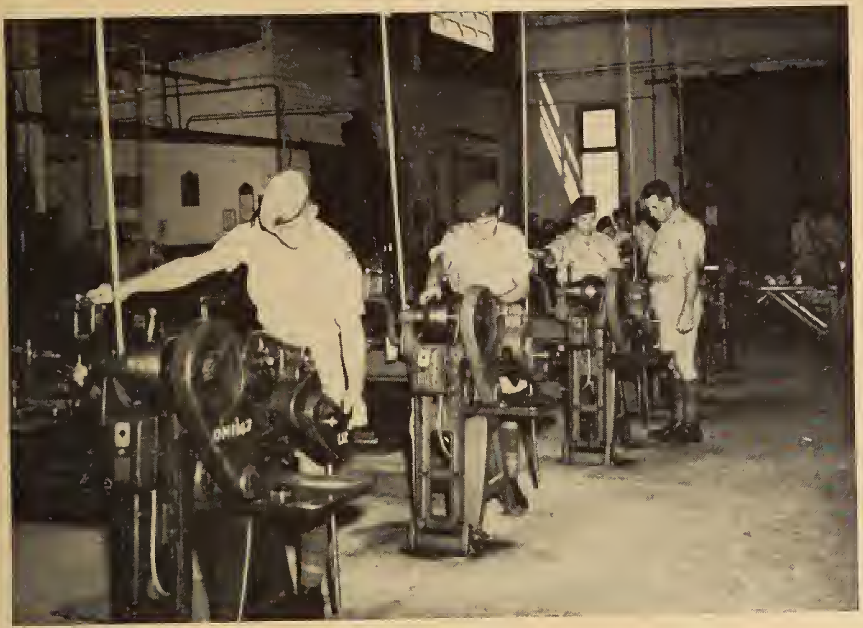
Assistant General Manager

Engineers in the Army

Last month, in response to a request from Col. C. R. Boehm, M.E.I.C., director of mechanical engineering for the Canadian army, the general secretary and assistant general secretary visited the Royal Canadian Electrical and Mechanical Engineers School at Barriefield, Ont. Past-President L. F. Grant, who lives in nearby King-

In the Officers' Mess at Barriefield: Lt.-Col. H. G. Conn, O.B.E.; Maj. G. W. Thompson; Lt.-Col. L. F. Grant; Lt.-Col. W. S. Hurt; Col. C. R. Boehm, M.B.E.; the general secretary; the assistant general secretary; Maj. G. T. Kirk, M.B.E.





A section of the machine shop of the artificer company at Barriefield.

the day's inspection, they should have no misgivings on that score. The evidence was all to the effect that engineers with RCEME were not losing contact with the practical side of the profession.

In the matter of personal contact, and the character development which is too often underemphasized in the education of engineers, the military engineers should be in just as favourable positions as their civilian colleagues, if they will pursue active membership in the appropriate professional societies.

Engineers acquainted with the organizational problems of the RCEME Corps would have been as impressed by the visit and the discussion as was the general secretary. In the beginning, professional engineers were distinctly in the minority in the Corps. At Barriefield, Col. Boehm told the visitors that 58 per cent of the officers are now professional engineers and only graduate engineers are being admitted to commissioned rank.

ston, accompanied the visitors in the inspection of the school.

It was a most interesting experience. The school is fully equipped with machine tools, shops, and all technical supplies and vehicles necessary for the effective action of a modern army. Lt.-Col. W. S. Hunt, M.E.I.C., commanding officer, gave a good deal of credit for the efficiency of the school to the group of some fifteen senior N.C.O.'s who were, for the most part, operating heads of the various shops.

The visitors saw undergraduates from the Canadian Officers Training Corps of the various universities under instruction in blacksmithing, woodworking and machine shops which would have been a credit to the most efficient equivalent establishment in industry. The vehicle, armament, fire control instruments, and electronics companies were not operating on the day of the visit, but N.C.O.'s and officers in charge, were on hand to explain the variety of equipment and to answer a barrage of questions.

After an excellent dinner in the officers' mess, the general secretary spoke to the class of 1949 graduates who are at present undergoing basic RCEME training. These 37 young engineers proved to be an attentive audience and there was a full discussion of the professional problems which they felt were important. One of the questions has been as to whether a career in the RCEME Corps might mean losing contact with industry and civilian engineering, or perhaps not gaining sufficient experience in engineering practice. The general secretary was able to assure them that, on the basis of what he had seen during

Newfoundland Branch

The first stage of setting up this new branch was completed in St. John's on August 16th by the election of the provisional officers. The general secretary made a quick trip to the new province in order to participate in these preliminary arrangements and to discuss the programme for the final ceremony of the inauguration.

The president and several officers of the Institute will arrive in St. John's on September 16th. The ceremony will be carried out on the following day. In all, the president's party to arrive by boat will total eighteen people, including the wives. At St. John's it will be augmented by six more members from outside the province. It looks as if this would be the largest group ever to accompany a president for a branch visit.

The president's tour in addition to St. John's will include Grand Falls and Corner Brook, at which points there are several members of the Institute employed by the larger paper making companies.

The Institute record shows about fifty members in the new province. Information supplied by some of these members indicates that there are about one hundred engineers on the island. This will provide excellent opportunities for the Institute to expand its membership and thereby its usefulness.

In addition to the points already mentioned there are members at Deer Lake, Gander, Clarensville and Wabana.

The provisional officers are as follows:

Chairman: E. L. Baillie, division manager, Imperial Oil Limited, St. John's.

Vice-chairman: G. H. Desbarats, consulting engineer, St. John's.

Secretary-treasurer: James M. Hopkins, Foulis & Bennett Electric Co. Ltd., St. John's.

Executive: Grant R. Jack, city engineer, St. John's; E. H. Bartlett, Newfoundland Light & Power Company, St. John's; G. W. Cummings, consulting engineer, St. John's; J. B. Angel, president, United Nail & Foundry Co. Ltd., St. John's; E. L. Ball, Anglo-Newfoundland Development Company, Grand Falls; H. S. Windeler, Anglo-Newfoundland Development Company, Grand Falls; H. K. Walter, Bowater's Paper Corporation, Corner Brook; Eric Hinton, Bowater's Paper Corporation, Corner Brook (Deer Lake); W. L. Stuewe, Dominion Steel & Coal Corporation, Wabana.

Royal Canadian Engineer Memorial Scholarship Trust

The announcement of a R.C.E.-M.S.T. was recently made by the chief engineer at Army HQ. Ottawa. This puts into effect a plan conceived by Brig. G. Walsh, C.B.E., D.S.O., M.E.I.C., when, as chief engineer of First Canadian Army in North West Europe, he initiated the collection of voluntary contributions from all ranks of the Royal Canadian Engineers overseas and in Canada, for a memorial to their fellow sappers who lost their lives in the Second World War.

When first proposed the fund was described only as a "Memorial," and all ranks were invited to suggest the form in which the Memorial could most suitably be created. The opinions received were overwhelmingly in favour of some sort of educational grant to deserving individuals rather than any physical memorial such as a monument or building which would receive only rather localized attention. Recommendations as to how this could be implemented were divergent however, and it was decided to wait until after the war to assess all the implications and establish the fund on a sound basis.

The Military Engineers' Association of Canada was asked to make recommendations to assist in reaching a decision. This Association is composed of ex-officers of the Corps, Reserve Force officers, ex-R.E. officers resident in Canada, and members of the engineering profession in Canada who are associated with the Army. Ultimately the question was referred back to the originator, Brig. Walsh, the honorary colonel commandant, Brig. J. L. Melville, C.B.E., M.C., E.D., M.E.I.C., and the chief engineer, then Col. H. L. Meuser, O.B.E., M.E.I.C., with two main alternatives from which to choose:

(a) To establish an educational fund to assist selected deserving cases among the sons of Sappers in obtaining an engineering degree, when this might otherwise be beyond their means

(b) To establish widespread scholarships on a long-term basis.

In the first alternative, because the fund is relatively small, it was thought that only a very few of the candidates eligible for financial assistance could be assisted and such assistance could only be a small portion of the cost of higher education. Further, even on a limited basis, the fund, and with it the Royal Canadian Engineer Memorial, would disappear in about 15 years. The second alternative was therefore selected as most truly accomplishing the original intention for which contributions were made and, within the capacity of the capital available, will provide a long-term, widely recognized Memorial. Each Scholarship will be approximately $125.00 and on this basis the Memorial will endure for about 50 years.

The Scholarships are to be offered annually in the following universities and colleges: Nova Scotia Technical College, Halifax; University of New Brunswick, Fredericton; Laval University, Quebec City; McGill University, Montreal; Queen's University, Kingston; University of Toronto; University of Manitoba, Winnipeg; University of Saskatchewan, Saskatoon; University of Alberta, Edmonton; University of British Columbia, Vancouver; Royal Military College, Kingston.

In the Royal Military College it is available to Cadets in their graduating year, in all other cases to students in the year before graduation, who are members of the Canadian Officers' Training Corps and enrolled in an engineering faculty leading to a degree of bachelor of applied science or an equivalent in the field of engineering. After selection Royal Canadian Engineer Memorial Scholars must present certificates of enrolment in their final year of university training to signify their intention of actually achieving a degree. This provision is applicable to R.M.C. graduates who are selected as well as to those scholars selected from the universities.

The selection of scholars is to be done initially by the universities and is to be based on academic standing, qualities of leadership as evidenced by activities in the C.O.T.C. and student affairs generally. Applications are open from students in any branch of the C.O.T.C. but, in the event of equality in the prior two main characteristics, preference will be given firstly to the sons of former members of the Corps of Royal Canadian Engineers, and secondly to those enrolled in the R.C.E. Wing of the C.O.T.C. In the case of the R.M.C. this condition is determined by the Cadet's choice of the R.C.E. for his commission upon graduation.

Pollution of International Boundary Waters

Condensation of an Interim Report by The Board of Technical Advisers to the International Joint Commission, March 1949

Under date of April 1st, 1946, the Governments of the United States and Canada directed a joint reference to the International Joint Commission pertaining to an investigation of pollution, by sewage and industrial wastes, in the boundary waters of St. Mary's River, St. Clair River, Lake St. Clair, and the Detroit River. The Commission was requested to report whether these waters were actually being polluted on the other side of the boundary to the injury of health or property on the other side of the boundary, and if so to what extent, by what causes, and in what localities is such pollution taking place.

If the Commission found that pollution was taking place, it was asked to suggest measures for remedying the situation and, if remedial or preventive works are necessary, to indicate the nature, location, and extent of such works, and the probable cost thereof, and by whom and in what proportions such cost should be borne.

Field Operations And Hearings

Field operations began in August 1946. The work was carried on continuously from the start, and was practically completed at the close of navigation in 1948. This has simultaneously called for special research on laboratory techniques and procedures, including studies on industrial waste taste, determination of phenol and structurally related compounds, procedures for taste tests on river waters and industrial wastes following chlorination, and analytical methods for boundary waters quality control.

The field work required detailed studies of 47 major U.S. industrial plants and 20 major Canadian industrial plants; pollution by navigation; water quality at municipal water intakes, sewer outfalls, and bathing beaches, on both sides of the boundary; and extensive float studies of currents in these waters. Public hearings for municipalities, industries, and all other interested parties were held at Detroit, Windsor, and Sault Ste. Marie, during the summer and fall of 1948, to obtain statements as to processes for the reduction or elimination of waste pollution, cost estimates of remedial measures, information upon the time required for completion of remedial measures, and criticism and comment on the preliminary Objectives for Boundary Waters Quality Control, adopted by the Commission in April 1948.

The task of examining and evaluating assembled data is going forward. There is still much to be done before a complete report can be made available. This interim report gives certain preliminary conclusions reached as a result of the data examined thus far.

It is found that more than two and a half million people, exclusive of those in rural areas use the connecting waters from Lake Huron to Lake Erie as a source of public water supply. For this purpose alone, total water pumpage exceeds 420 million U.S. gallons per day. Water used by industry, exclusive of power, exceeds a further billion U.S. gallons a day. Extensive use of boundary waters is made for bathing. Pollution is the result of the discharge of domestic sewage and industrial wastes from various sources. Today these wastes are a major problem, particularly when they are untreated.

The great increase in sewage has augmented the potential hazard to health from bacterial pollution in the use of these waters for domestic purposes. The enormous volume of industrial wastes poured into these waterways often interferes with purification processes. If the 1913-48 trend in pollution continues unchecked it will ultimately be impossible to use these waters safely for domestic purposes, and it will become economically burdensome to treat the water for industrial use. This implies relocation of water intakes, and the possible relocation of industries, entailing excessive capital outlay. Moreover, this increasing pollution forces people to travel in search of recreation, or exposes them to great hazards, constituting a violation of the treaty obligations assumed by the two countries.

In 1913 the major source of pollution was domestic sewage, which contributes bacteria and oxygen depleting substances. The 1948 figures indicate that oxygen depleting pollution, when adequately diffused in the waters, is not a major problem. Coliform results show as wide variations as from acceptable drinking water quality to unsuitability as a source of public water supply, even with complete treatment. The St. Clair river shows localized badly polluted areas. Lake St. Clair figures, except for localized areas, in general are low, denoting suitable waters for most uses. Results on the Detroit river reveal progressive degradation, with increased diffused bacterial pollution from both shores, so that even the normally less polluted water in the centre of the river contains high coliform results.

Industrial wastes are the chief source of chemical pollution. From an almost complete absence of such pollution in 1913 these wastes have increased to major proportions in their effect on the quality of these waters. This pollution does not all reach the boundary waters since some is impounded and some is dissipated in tributary streams. That reaching the boundary waters is not discharged at a uniform rate nor is it evenly distributed. Because pollution generally hugs the shore it has thus far been possible for municipalities and industries to obtain water beyond the heavily polluted zones.

The presence of oil on boundary waters, particularly at bathing beaches and recreational areas has given rise to many complaints. These complaints are well founded. Tastes and odours in these boundary waters are caused principally by industrial wastes. Many complaints occurred prior to the initiation of this investigation. These have continued during this period of study but the occurrences have been less frequent and of lower intensity. Float tests have clearly demonstrated that this pollution travels from either side of the boundary to the other. This is particularly true of surface pollution such as oils.

Hearings Before The International Joint Commission

The following summary, prepared by the Board of Technical Advisers, sets forth the principal points developed from hearings held by the International Joint Commission at Detroit, at Windsor, Ontario, and at Sault St Marie, between June and November, 1948:

1. The pollution of boundary waters reached such a degree of contamination in 1945 as to stimulate complaints coming from both sides of the boundary.
2. Evidence indicates that the pollution affecting municipal water supplies is due both to industrial wastes and domestic sewage.
3. Pollution has resulted in the serious destruction of wild fowl, fish and other aquatic life.
4. Plans of industries indicate that most of them take their responsibilities for keeping deleterious wastes out of boundary waters seriously, and are making plans or have completed works for the treatment of their wastes.
5. Plans for the further collection and treatment of municipal wastes are in preparation by various municipalities, including Detroit and the metropolitan area.
6. Municipalities are relatively inactive at the present time towards the construction of works for treatment of wastes. Boundary waters are denied the benefits of municipal pollution control by their limited abilities for financing.
7. The need for providing funds to construct municipal treatment works has been shown.
8. The people living near the boundary waters have been frequently thwarted in their efforts to make recreational use of boundary waters because of pollution.
9. The expenditure of large sums to develop convenient public

recreational areas indicates the desire on the part of the people for such areas.

10. To protect recreational investments, and to permit present and future industries to have access to reasonably clean waters for industrial purposes, pollution should be curbed and much of the pollution now being added should be eliminated.
11. Regional planning embracing the areas tributary to the boundary waters has been indicated as a definite need to expedite and facilitate the control of pollution.
12. Evidence shows that the Commission should maintain a continuing interest in the condition of these waters, and should effectively exercise such interest.

Costs of Correction

They concern municipalities and industries. As yet the estimates of costs for remedial measures are incomplete, and must be regarded as preliminary only. For municipalities the costs estimated are:

On the United States Side	$68,000,000.
On the Canadian Side	14,000,000.
TOTAL	$82,000,000.

For industries the costs estimated are:

On the United States Side	$13,000,000.
On the Canadian Side	3,000,000.
TOTAL	$16,000,000.

Preliminary Conclusions And Recommendations

The Board of Technical Advisers, based on information now available offers the following preliminary conclusions and recommendations:

1. Continuing contact by the Commission with the pollution control problem is essential in order that remedial measures now being planned may be completed and further measures stimulated.
2. The Commission should formulate a water pollution abatement programme for St. Mary's River area and the Lake Huron to Lake Erie waters in consultation with Federal, State, Provincial and Municipal authorities.
3. Remedial measures should be brought about through existing pollution abatement authorities, with active support of the Commission.
4. Definite plans for financing remedial works should be formulated. In this there should be co-operation between the Commission and Federal, State, Provincial and Municipal governments.
5. Supervision by the Commission in the future should be maintained through a Board consisting of at least one representative from each of the following:

(a) Department of National Health and Welfare, Canada.
(b) Province of Ontario.
(c) United States Public Health Service.
(d) State of Michigan.

Technical service will be necessary to assist such Board. The Commission, it is understood, is authorized by the Reference to call upon appropriate governmental agencies to furnish the required technical service.

Correspondence

Port Hope, Ont.,
August 31, 1949

To the Editor:

Mr. Finlayson in his letter appearing in the August number of the *Journal* very correctly remarks that the problems involved in the regimentation and utilization of the St. Lawrence waters are thought provoking. With this view the writer heartily agrees and such contributions as he has offered to the St. Lawrence discussion have been made more in the hope of influencing his fellow members to study and think over these problems, than with the intention of advocating any precise line of action.

There is precedent for private enterprise in such studies, for it is now about one hundred years since the Hon. John Young induced his fellow merchants of Montreal to embark on the, to them, crucial undertaking of building the Montreal Ship Channel. The Government of the day had initiated the undertaking and had abandoned it. The Hon. John Young and his associates undertook it at their own risk and for almost thirty-five years they carried it on to a final and triumphant success. But John Young was in this matter acting on the advice of his engineer, Mr. T. C. Keefer, who afterwards became the first president of the Canadian Society of Civil Engineers, and perhaps also the most honoured of all that line of distinguished gentlemen in that following his presidency of this Canadian society he was elected president of the American Society of Civil Engineers—a feat never since duplicated.

The problem has grown greatly since John Young's day and the St. Lawrence Waterway, as the writer now sees it in its ultimate perfection, is a waterway extending from Port aux Basques in Newfoundland to the head of the Great Lakes. Port aux Basques is practically always open to ocean navigation and the final waterway should be free from serious ice obstruction and large enough to accommodate any vessel that could pass through such great commercial arteries as the Panama Canal. Rome was not built in a day and Canada can be content to progress to an ideal, step by step, provided always that she never loses sight of the ultimate objective.

Canada might profit greatly now if another John Young were to arise among her statesmen, a man who had the capacity to see the great vision of an ice free Canadian Waterway extending from Newfoundland to Lake Ontario and the persuasive power that could win for the vision the support of his countrymen. Such a man could readily find the necessary technical advisers in the ranks of the Institute of which the writer has been a member for more than sixty years.

The Institute can very wisely support any proposal that aims to open up these unexplored fields of engineering activities to thorough investigation and study.

One comment on cost may be made with assurance, namely, that the task that would confront Canada today if it undertook this great enterprise would be less formidable than the task that confronted John Young and his associates a hundred years ago. The present day task would be so much greater in the size of the construction units that comparison is impossible, but the present day resources of the Dominion of Canada, backed up by those of the two great provinces of Ontario and Quebec, are almost infinite in comparison with the sources of revenue that were at the command of John Young. The provinces in their need of hydro-electric power would very nearly wipe out fifty per cent of the cost of the entire enterprise which as a whole should be self liquidating.

Some statements in Mr. Finlayson's letter call for special comment. First it may be said that the studies of the Joint Board of Engineers on water temperatures were limited to the St. Lawrence River itself and did not touch on the source waters in Lake Ontario. Neither did they cover any extended period of time being limited to the freezing up weeks in December for two consecutive years. The writer can speak positively on this point as he has discussed the results of Prof. Church's studies on Lake Michigan with members of the Board and can remember the somewhat astonished incredulity with which they welcomed a statement of Prof. Church's conclusions. Some limited study of lake temperatures was made in the 1920's by Prof. Howard T. Barnes on instruction from the Hydro Electric Power Commission of Ontario, but Prof. Barnes was not equipped to study the temperatures in the deep waters of the Lake nor has his report ever been published. However, the results of his studies are made clear in his book, "Ice Engineering", published about two years later than the report of the Joint Board of Engineers. On page 303, Dr. Barnes states: "It has long been recognized that the main river of the St. Lawrence would maintain itself free of ice entirely from Prescott to tide water if it were not for the expansion occasioned by the lake areas and wide shallow bays. It was pointed out many years ago if the lakes could be canalized and the bays enclosed in by suitable piers the river would never freeze over."

Few engineers would care to challenge Dr. Barnes' opinion on matters of ice formation and it is a matter of sincere regret that the Institute has never suitably acknowledged the debt that its members owe to this scientist who over a period of nearly forty years devoted himself primarily to study of the factors that control ice formation and dissipation. In the end his labours completely broke down a constitution that was never robust.

In closing, it may be stated that the annual temperature cycle of the waters of Lake Ontario has never been systematically studied by anyone and for temporary conclusions about those temperatures the profession is forced to depend on conclusions drawn from work done by Prof. Church in Lake Michigan under the aid and guidance of the University of Chicago.

The data secured by Prof. Church from observations made over three successive winters on Lake Michigan definitely support Dr. Barnes' conclusions, and this writer is content to accept his opinion, at least until further and more exhaustive studies have been made.

Mr. Finlayson refers to certain water temperatures taken in the month of February near the outlet of Lake Ontario. It may be said that such observations are of little use in the study of the main problem. From a sound hydrological standpoint Lake Ontario ends in a reef marked by a series of islands often referred to as the Ducks, and this reef has been aptly named by a correspondent of the writer's, as the Prince Edward Reef. It lies perhaps twenty miles west of the site of the observations.

This reef completely cuts off the eastern section of the Lake from the deep main body and creates a shallow heat wasting area that is almost equal in extent to the whole water surface of the St. Lawrence River, lakes included, between Kingston and Quebec. This is the greatest heat wasting area along the course of the river and as its cross section is gigantic the waters move across it on an average at less than a snail's pace. It would be a marvel if the waters reached the present mouth of the river at the end of February with a temperature appreciably above 32 deg. F. It is in the crossing of this shallow tail end of the lake that the major losses of heat energy can be prevented. Waters can be carried across it in perhaps four hours that now take several days to reach the same destination and time is a primary factor in determining heat losses.

Mr. Finlayson also refers to the very thorough study of the regulation of the levels of the Great Lakes, made by the Joint Board of Engineers. These studies are beside the mark for they fail to include a recognition of the fact that the St. Lawrence and Ottawa Rivers comprise one river system and should be jointly regulated if a maximum development of hydro-electric power is to be secured. In this writer's judgment, the critical section of the St. Lawrence Waterway in which the most perfect regulation of discharge would be most beneficial is the section extending from the junction of the two main rivers to the wide and deep salt waters of the Estuary which are not met up with until Ile aux Coudres, well east of Quebec, has been reached. It would appear to be possible to so regulate the water-levels of this section of the river that there will be neither marked high water nor low water to trouble commerce in the harbour of Montreal.

The study of the levels of the Great Lakes made by the Joint Board of Engineers is a highly creditable piece of work in which consideration of certain major factors has been completely neglected. It is fair to place the blame for this oversight on the parties who issued the instructions to the Joint Board and not to the members of it.

Mr. Finlayson also refers to the difficulties arising from ice that will be met with in the lock and harbour basins in the winter. The writer has never taken such difficulties very seriously. The profession has built sheds—wide, high and long—to cover railway trains and to protect aircraft, and its members interested in structural engineering will doubtless heartily welcome an opportunity to build similar protections to locks and harbour basins. Under properly designed cover the action of the great cosmic forces that abstract heat energy from open waters will very largely be prevented; it will involve no great expense to make good the small heat losses that will occur under such conditions.

It is to be feared that this letter is too brief to disclose the problem, as the writer sees it, to the satisfaction of his fellow members and he has therefore put down his thoughts at greater length in a paper that has been sent to the officers of the Institute. He hopes that this paper will be counted worthy to be presented to one of the meetings of the Institute; he would like to hear very free and frank criticisms of what must appear to many to be revolutionary objectives.

In the meantime his thanks are due to Mr. Finlayson for directing attention to several of the most important questions connected with the problem.

J. G. G. Kerry, M.E.I.C.

News of Other Societies

The 20th annual meeting of the **Canadian Chamber of Commerce** (Board of Trade Building, Montreal 1) is arranged to take place at the Chateau Laurier, Ottawa, Ont., on October 25-27, 1949.

The **Community Planning Association of Canada** (56 Lyon St., Ottawa, Ont.) has organized the National Citizens Planning Conference to take place at the Fort Garry Hotel, Winnipeg, Man., October 6-8, 1949.

The American Welding Society (33 West Thirty-ninth Street, New York 18, N.Y.) will hold its 30th annual meeting at the Hotel Cleveland, Cleveland, Ohio, during the week of October 17.

The thirty-first annual meeting of the **American Standards Association** (70 East Forty-fifth Street, New York 17, N.Y.) will take place October 11-14 at the Waldorf-Astoria in New York City.

The 1950 annual meeting of the **American Institute of Mining and Metallurgical Engineers** (29 West 39th St., New York 18) will be at the Statler (Pennsylvania) Hotel, New York City, February 12-16.

The first Pacific area national meeting of the **American Society for Testing Materials** (1916 Race St., Philadelphia 3) is scheduled for October 10-14, 1949, at San Francisco, Calif.

The **Federation of Sewage Works Associations,** (325 Illinois Building, Champaign, Illinois) will meet at Hotel Statler, Boston, Mass., for the 22nd annual meeting on October 17-20, 1949.

Host to the Federation will be the **New England Sewage Works Association,** which will combine its twenty-first annual meeting with the national convention.

The **American Society of Mechanical Engineers** (29 West 39th St., New York 18) has arranged its 1949 fall meeting for September 27-30, at Erie, Pa.; and the 1949 annual meeting of the Society, for November 27 to December 2, in New York.

The midwest general meeting of the **American Institute of Electrical Engineers** (33 West Thirty-ninth Street, New York 18) will take place at the Netherland Plaza Hotel, Cincinnati, Ohio, October 17-21, 1949.

The **American Society of Civil Engineers** (33 West 39th Street, New York 18) plans the fall meeting to take place at Washington, D.C., November 2-4.

The National Conference on Industrial Hydraulics, October 26-27, 1949, at the Sheraton Hotel, Chicago, Ill., will be sponsored by the Armour Research Foundation and the Graduate School of Illinois Institute of Technology.

Information can be obtained from S. F. Musselman, Armour Research Foundation, Technology Center, Chicago 16, Ill.

Personals

Notes of the Personal Activities of Members of the Institute

R. L. Dunsmore, M.E.I.C., was elected president of Champlain Oil Products Ltd., Montreal, at a meeting of the board of the Company in July.

Mr. Dunsmore has 30 years experience in oil refining and production. He graduated from Queen's University in 1915 with a B.Sc. degree. His early engineering experience was with the Department of Public Works of Canada, at Fort William, Ont. From 1914-1919 he was with the Corps of Canadian Engineers overseas, from which he retired with the rank of major. In 1919 he was appointed assistant city engineer of Sarnia, Ont. Later in the same year he joined the engineering staff of the Imperial Oil Ltd., at Sarnia. In 1922 he was appointed engineer in charge of construction for the Imperial Oil refinery at Calgary, and later assistant superintendent. In 1926 Mr. Dunsmore went to Talara, Peru, S.A., for the International Petroleum Company, as general superintendent.

He became superintendent of the Halifax refinery of Imperial Oil Ltd. in 1930.

During the recent war he served with the Royal Canadian Navy, and returned in 1944 to be manager of the Montreal Refinery of Imperial Oil.

He joined International Petroleum Company Ltd., at Toronto, in 1946 as manager of refineries. He was coordinator of manufacturing for that organization before receiving his recent appointment with Champlain.

Drummond Giles, M.E.I.C., was elected in August to the presidency of Courtaulds (Canada) Limited, Cornwall, and continues as general manager.

Mr. Giles, who represents the Cornwall Branch of the Council of the Institute, has been vice-president and general manager of the Company since 1944.

He is a graduate of McGill University, Montreal, having received a B.Sc. degree in 1927. He joined Canadian SKF Limited that year as an engineer at Montreal. He transferred to Toronto two years later as assistant chief engineer, and was made chief engineer in 1930. In Montreal, he was district manager for Canadian SKF from 1932 to 1938, and he was then named vice-president.

From 1942-44 he served with the Department of Munitions and Supply at Ottawa as special assistant to the co-ordinator of production.

Group Captain C. A. Davidson, M.E.I.C., director of construction engineering, Air Force Headquarters, Ottawa, is retiring from the Permanent Force and will be returning to Edmonton, Alberta, where he was for many years with the Provincial Department of Public Works.

He took over the duties of director in July 1946, having previously served as chief construction engineering officer at Maintenance Command Headquarters, Uplands, Ont., and chief works officer at Winnipeg, Calgary, Regina and Victoria.

For his wartime services, Group Captain Davidson was made an Officer of the Order of the British Empire, and also holds the United States award of Officer of the Legion of Merit.

Dr. J. J. Green, M.E.I.C., of Ottawa, has been appointed deputy director general of the Defence Research Board, and scientific adviser to the chief of air staff.

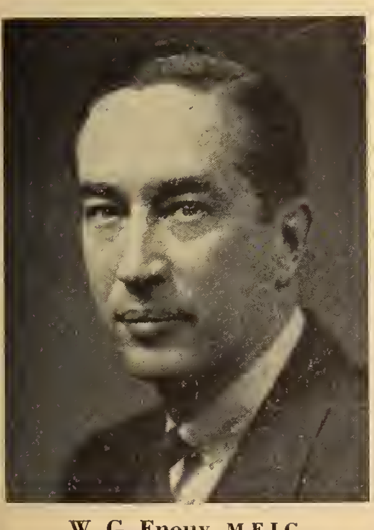
Dr. Green was educated at the University of London, taking his B.Sc. with first class honours and his A.R.C.Sc. from the Imperial College of Science and Technology in 1928. He was awarded the Imperial College Governors' prize in physics, and a Sir Otto Beit Scientific Research Fellowship, completing his Ph.D. in aeronautics in 1930.

From 1930 to 1943 Dr. Green was on the staff of the National Research Council, division of mechanical engineering, latterly as head of the aerodynamics section. In 1943 he enlisted in the R.C.A.F. and was appointed chief research engineer, Test and Development Establishment, Rockcliffe. In 1943, Dr. Green received the M.B.E. for valuable public service in the field of scientific research, and in 1945 the King's commendation for valuable service in the air.

From 1945-49 Dr. Green was the chief research aeronautical engineer of the Air Transport Board, Ottawa.

Dr. Green is an Associate Fellow of the Institute of the Aeronautical Sciences and was honoured last year by election to Fellowship of the Royal Aeronautical Society.

W. G. Enouy, M.E.I.C., has been appointed general sales manager, promotion and development, for Robertson-Irwin Limited, with headquarters in Hamilton, Ontario.



W. G. Enouy, M.E.I.C.

From graduation in 1927 as a B.A.Sc. from the University of Toronto, Mr. Enouy has been continuously in the employ of H. H. Robertson Co. Limited, being transferred in 1936 from Toronto head office engineering to Montreal as district manager; recalled to general sales in 1946 and subsequently moved to Hamilton with the transfer of Company headquarters to that city later in the year. With the amalgamation of H. H. Robertson Co. Limited and Thomas Irwin & Son Limited as Robertson-Irwin Limited, he assumed the duties of sales manager, Robertson division, acting in that capacity until his recent appointment.

G. Agar, M.E.I.C., has been appointed executive engineer and assistant general manager of Canadian Vickers Ltd., Montreal. He has been associated with Canadian Vickers since 1917, when he was chief mechanical draughtsman and estimator. He had previously been with Vickers Ltd. in England.

R. K. Thoman, M.E.I.C., was appointed in August, assistant general manager of the engineering division of Canadian Vickers Ltd., Montreal.

He had graduated from Queen's University in 1936 and was production manager of Remington Rand Limited, at Hamilton, Ont., before joining Canadian Vickers in 1939.

C. J. Connolly, M.E.I.C., is building engineer for North American Buildings Limited, at Winnipeg, Man. He was previously with the Department of National Health and Welfare, Ottawa, where he was superintending engineer of the Indian Health Services.

Dr. L. J. J. L'Heureux, M.E.I.C., is employed by the Defence Research Board at the Canadian Army Research and Development Establishment, Valcartier, Que. He received the degree of doctor of engineering (electrical) from Johns Hopkins University, Baltimore, Md., this year. He had obtained the B.Sc. degree in engineering physics at the University of Saskatchewan in 1944.

H. D. Nickle, M.E.I.C., has been made manager for Combustion Engineering-Superheater Inc., at the new district office for the Northwest territory, including the states of Washington and Oregon. The new office is located at Seattle, Washington.

Mr. Nickle, a mechanical engineering graduate, joined Combustion Engineering Corp., Ltd., of Canada, in 1937, as manager of service and erection in Montreal. Later he was engaged in contract work and in sales relating to the pulp and paper industry. In 1945, he was transferred to the New York office of Combustion Engineering - Superheater, Inc., in charge of paper mill division sales.

Major S. Slater, M.E.I.C., has been transferred to Ottawa by the Department of National Defence. He was previously in the Quebec Command, at Montreal.

Lt.-Col. G. K. Wade, JR.E.I.C., was appointed, in July, highway engineer of the northwest highway system. With the appointment came the promotion to his present rank.

Col. Wade is a graduate of Royal Military College, Kingston and gained his science degree at Queen's University after his return from overseas.

He had commanded a field company, R.C.E., in Sicily and Italy and attended the Middle East staff course at Haifa, Palestine, in June, 1945.

Col. Wade was officer commanding the 23rd Field Squadron, R.C.E., at Chilliwack, B.C., from May until October, 1947, when he went to Whitehorse, Yukon Territory to be assistant highway engineer.

A. D. Brown, JR.E.I.C., is with the Steel Company of Canada in Montreal, Que.

Mr. Brown is a graduate of Queen's University, class of 1947. He was, since then, with Northern Electric Co. Ltd., in Montreal.

Irving Orloff, JR.E.I.C., is employed by Canadian Industries Ltd. as assistant to the works project engineer of the nylon division at Kingston, Ont.

He graduated in civil enigneering from University of Manitoba, and in mechanical engineering from University of Saskatchewan in 1948. He was with Pembina Mountain Clays, Winnipeg, before his recent appointment.

J. F. Deniger, JR.E.I.C., is a sales representative with Associated Chemical Company of Canada Limited, Toronto.

Mr. Deniger graduated in 1945 from Ecole Polytechnique, Montreal. He was with Taylor Instrument Companies of Canada, Montreal, from 1947. He had been a patent attorney with Marion & Marion, Montreal, after his graduation.

Rex Fillingham, S.E.I.C., has joined the staff of Vulcan Iron and Engineering Co. Ltd. in Winnipeg, Man.

S. J. Babin, S.E.I.C., who graduated this year from the University of New Brunswick, has been employed as a construction engineer with Central Mortgage and Housing Corporation, Montreal.

L. J. Eibner, S.E.I.C., is with the Foundation Company of Canada in Montreal.

Mr. Eibner had been with Dominion Bridge Co. Ltd., in Winnipeg, Man., since his graduation in 1948 from the University of Manitoba in civil engineering.

Howard A. Bradley, S.E.I.C., is on the staff of Stone and Webster Engineering Corporation, Toronto, Ont. He is a 1949 graduate in civil engineering from the University of Toronto.

S. G. Warner, S.E.I.C., who graduated in civil engineering from the University of Toronto this spring, is now employed in the water development design office of the P.F.R.A., Department of Agriculture, Regina, Sask.

L. V. Lockhart, S.E.I.C., is with Canadian National Railways at Winnipeg, Man. He graduated this year in electrical engineering from University of New Brunswick.

Visitors to Headquarters

Edward C. Thorne, M.E.I.C., Ottawa, Ont., August 9.
W. J. Dick, M.E.I.C., Edmonton, Alta.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

E. C. Perley, M.E.I.C., of Ottawa, Ont., passed away on August 4, 1949.

Mr. Perley, who was wartime director of tank production for the Dominion Government, was born at Wolseley, Sask., in 1905. He studied engineering at University of Toronto and McGill University, receiving a B.Sc. degree from the latter in 1928.

He joined the English Electric Co. of Canada Limited in 1928, working in Toronto for three years in the estimating department at St. Catharines, Ont. He was appointed manager of the apparatus sales department of the Company. He was general sales manager from 1936 to 1942.

He joined the Department of Munitions and Supply, tank production branch in 1942, as chief production engineer. Later that year he was made director of production for that Branch; and from 1943 to 1946 he was director of production in the automotive and tank production branch of the Department. He was later appointed a member of the transportation equipment committee of the Combined Production and Resources Board in Washington. In 1946 he was granted the O.B.E. in the Dominion Day Honours List.

That year he joined Corporation House Limited in Ottawa, and he was managing director of the Company at the time of his death.

Mr. Perley joined the Institute in 1943 as a Member.

Albert Charles Gardner, M.E.I.C., who died at Medicine Hat, Alta., on April 27, 1949, was with the Department of Public Works of Alberta.

He was born at Haddington, Scotland, in 1887. He attended Heriot-Watt technical College in Edinburgh and served a pupilage in civil engineering from 1906 to 1909 with L. B. Barclay, F.R.S.E. He was made assistant engineer in 1908 and chief assistant engineer in 1909. He resigned to become a contractor's engineer for Neil McLeod & Sons, on the Troon Water Works at Ayr, Scotland.

In Canada, from 1911 to 1914 he did survey work and draughting. He joined the Irrigation Branch of the Department of the Interior in Calgary in 1915, but in 1917 he went to the Canada Land and Irrigation Company Ltd. He remained with the Company for several years, doing location work for water distribution in the Company's western district, survey work, and field work on hydrometric studies.

Mr. Gardner was engaged by the Department of Public Works of the Province of Alberta in 1926 in the capacity of instrumentman on road right of way surveys. He continued in this capacity until 1929, when he was appointed assistant resident engineer on road construction. In 1930 he was appointed district engineer in charge of road construction and maintenance in the Medicine Hat district of Alberta. In 1939 he was transferred to the St. Paul district and in 1949 was transferred back to the Medicine Hat district, where he was at the time of his death.

Mr. Gardner joined the Institute in 1922 as an Associate Member, transferring in 1940 to Member.

Lt. R. L. Hunter, S.E.I.C., who was a third year student in engineering at University of New Brunswick and a veteran of the recent war, died on August 11 of poliomyelitis. He was in his thirtieth year.

Lt. Hunter served for six years with the R.H.R. Black Watch. He was wounded in action on the Normandie beaches.

A former Montrealer, Lt. Hunter had joined the Institute this year, and he was spending the summer months with the Royal Canadian Electrical and Mechanical Engineers.

ERRATUM

When reporting in the August issue the death of Major-General H. M. Cawthra-Elliot, of Cawthra Lotten, Lakeview, Ont., the *Journal* was inaccurate in its use of his surname.

Just before his marriage in Toronto, in June, 1921, to the former Grace Millicent Cawthra, he legally assumed the surname "Cawthra-Elliot". The *Journal* report of his activities prior to that time should have referred to him by his original surname, Elliot.

NEWS of the BRANCHES

Activities of the Thirty-one Branches of the Institute and abstracts of papers presented at their meetings

Montreal

Junior Section

WM. C. SMITH, JR.E.I.C.
Secretary-Treasurer

Robert E. J. Layton, chairman of the papers committee of this section, has been very busy these past few months preparing for the coming year's programme.

The meetings will start October 3rd with the very timely topic **Television.** As in the past years, our meetings will take place on alternate Monday nights starting at 8.15 p.m. in the auditorium at Headquarters on Mansfield Street.

Other topics approved unanimously by the executive for presentation during the balance of this year include "Developments in Labrador", "Functions and Influence of Labour Unions", and "How you can get secrets to further your business from the National Research Council".

In addition to the above academic gatherings, the executive plans to continue the policy of providing as many social meetings as possible. Friday, November 11th is scheduled for an Oyster Party, which we hope will be as good as the one held last fall when 100 members came out and thoroughly enjoyed themselves.

Plans are not complete, but Mr. Fernand Noiseux, Chairman of the Entertainment Committee, is busy preparing for our Annual Dance which will take place early in December. This event has always been a terrific success.

RULES GOVERNING AWARD OF INSTITUTE PRIZES

THE SIR JOHN KENNEDY MEDAL

A medal, called the "Sir John Kennedy Medal," was established in 1927, to be awarded under the following rules in commemoration of the great services rendered to the development of Canada, to engineering science and to the profession by the late Sir John Keunedy, past-president of The Engineering Institute of Canada.

(1) The medal shall be awarded by the council of the Institute, at intervals of not less than two years, but only when the occasion warrants, as a recognition of outstanding merit in the profession or of noteworthy contributions to the science of engineering or to the benefit of the Institute.

(2) As a guide in making the award, the council of the Institute shall take into consideration the life, activities and standing in the community and profession of the late Sir John Kennedy.

(3) Awards shall be limited to corporate members.

(4) At the beginning of the year of award, all members of Council shall be asked for their recommendations, supported by reasons, for the award of the medal, which must be submitted to council not later than May first. The council of the Institute shall then give consideration to the recommendations, but will not necessarily adopt any of them. If, in the opinion of the council, no corporate member of the Institute thus recommended is of sufficient merit or distiuction, no award shall be made.

(5) The award shall be decided by letter ballot of the council in a form to be prescribed by the council. The ballot shall be mailed to each member of the council and shall state the date of the council meeting at which it is proposed to canvass the ballot, which shall not be less than twenty days after the issue of the ballot. Unless at least twenty-five votes are cast there shall be no award. There shall be no award if more than two negative votes are cast.

(6) Announcement of an award shall be made in *The Engineering Journal* and at the annual meeting, and, if possible, the presentation shall take place at that meeting.

THE JULIAN C. SMITH MEDAL

This medal was founded in 1939 by a group of senior members to perpetuate the name of the late past-president of the Institute. It is awarded for "achievement in the development of Canada." The inaugural awards—eleven in number—were made in 1940 and 1941, but subsequent awards are limited to not more than two each year.

The general secretary shall ask each past-president and each vice-president of the Institute for nominations, which shall be submitted to a committee of three consisting of the president and two members of Council appointed by him. This committee may select not more than two names from the nominations, which name or names shall be submitted by open letter ballot to all councillors not later than October first of each year. At least twenty days shall elapse before the ballot is closed. Unless at least twenty-five votes are cast there shall be no award. There shall be no award if more than two negative votes are cast.

It is possible that some special occasion—a centenary celebration or the like—may arise when it would evidently be desirable to award more than two Julian C. Smith medals. In such a case departure from the prescribed limit may be permitted, but only if authorized by a formal resolution of Council, stating the special reasons for the action.

DUGGAN MEDAL AND PRIZE

A prize of a medal and cash to a combined value of approximately one hundred dollars was established in 1935, to be given each year from the proceeds of a donation by Past-President G. H. Duggan, D.SC., LL.D., M.E.I.C., for the purpose of encouraging the development of the branches of engineering in which he practised.

The prize will be awarded for the best paper presented to the Institute in accordance with the following rules:

(1) Competition shall be open to all members of the Institute.

(2) The papers shall be presented to the Institute either at the regular meeting of a branch or at a professional meeting of the Institute, or directly to Headquarters. They shall not have been presented previously to any other body or meeting.

(3) Papers to be eligible for this competition shall deal with subjects concerning the use of metals for structural or mechanical purposes. Without limitiug the generality of the foregoing, it is suggested that the following topics come within this category, viz.: the economic and theoretical elements of design, fabrication, machining, transporting, erecting, the investigation of problems or failures, methods of overcoming difficulties, new methods of design or manufacturing, the recording of tests, and other features that add to engineering knowledge.

(4) Papers shall be the boua fide production of the author and proper credit shall be given for any assistance received from other parties, partners or reports. The relation of the author to the work shall be clearly stated. Papers shall be compiled and arranged with proper regard to literary value and shall constitute worthy contributions to the records of the engineering profession.

In judging the competition consideration will be given to the personal knowledge and appreciation of the problems and processes involved and the joint application of theoretical and practical considerations to the execution of the subject which are displayed on the part of the author.

(5) The papers shall be judged by a committee of three corporate members, eminent in the corresponding branch of the profession, appointed for the purpose by council as required.

(6) The award shall be made only when a paper of sufficient merit is presented. The prize year shall be from July 1st to June 30th and papers must be presented to Headquarters of the Institute by the 30th day of June.

(7) The prize shall be awarded at the annual meeting.

THE GZOWSKI MEDAL

A gold medal, called "The Gzowski Medal," is provided from the fund established in 1889 by Col. Sir Casimir Gzowski, A.D.C., K.C.M.G., late past-president of the Institute, and will be awarded according to the following rules for papers presented to the Institute:

(1) Competition for the medal shall be open ouly to those who belong to the Institute.

(2) The award of medals shall not be made oftener than once a year, the medal year shall be the year ended June last previous to the annual meetmg at which the award is to be made.

(3) The papers entered for competition shall be judged by a committee of five, to be called the Gzowski Medal Committee, which shall be appointed by the council as soon after the annual meeting of the Institute as practicable. Members and Honorary Members only shall be eligible to act on this committee.

(4) Papers to be eligible for competition must be the bona fide production of those who contribute them, and must not have been previously made public, nor contributed to any other society in whole or in part.

(5) The medal shall be awarded for the best paper of the medal year, provided such paper shall be adjudged of sufficient merit as *a contribution to the literature of the profession* but not otherwise.

(6) In the event of the committee not considering a paper in any one year of sufficient merit, no award shall be made; but in the following year or years, it shall be in the power of the committee to award the accumulated medals to the authors of different papers which may be deemed of sufficient merit.

(7) The medal shall be suitably engraved by the Institute, and shall be handed to the successful authors at the annual meeting, or be given to them as soon afterwards as possible.

THE LEONARD MEDAL

A gold medal, called "The Leonard Medal," is provided from the annual proceeds of a fund established in 1917 by the late Lieut.-Col. R. W. Leonard, and will be awarded in accordance with the following rules for *papers on mining subjects* presented either to The Canadian Institute of Mining and Metallurgy or to The Engineering Institute of Canada.

(1) Competition for the medal shall be open to those who belong to The Canadian Institute of Mining and Metallurgy or to The Engineering Institute of Canada.

(2) Awards shall be made not oftener than once a year, and the medal year shall be the year ended June last previous to the year in which the award is made.

(3) The medal shall be presented at annual meetings of The Engineering Institute of Canada.

(4) A committee of five shall judge the papers entered for competition, all of whom shall be members both of The Canadian Institute of Mining and Metallurgy and The Engineering Institute of Canada, this committee to be appointed by the council of The Engineering Institute of Canada.

(5) All papers presented shall be the work of the author or authors and must not have been previously made public, except as part of the literature of The Canadian Institute of Mining and Metallurgy or The Engineering Institute of Canada.

(6) Should the committee not consider the papers presented in any one year of sufficient merit, no award shall be made, but in the following year, or years, the committee shall have power to award the accumulated medals or to award a second prize in the nature of a silver medal, or a third prize of books to be selected by the committee.

(7) The medal shall be suitably engraved, containing the name of The Engineering Institute of Canada, and the words, "The Leonard Medal" together with the adopted design, and on the reverse side the name of the recipient, the date and any other inscription that may be decided upon by the committee.

THE PLUMMER MEDAL

A gold medal, called "The Plummer Medal," is provided from the annual proceeds of a fund established in 1917 by J. H. Plummer, D.C.L., and will be awarded according to the following rules for *papers on chemical and metallurgical subjects* presented to the Institute.

(1) Competition for the medal shall be open to those who belong to The Engineering Institute of Canada, and to non-members if their papers have been contributed to the Institute and presented at an Institute or Branch meeting.

(2) Award shall be made not oftener than once a year, and the medal year shall be the year ended June last previous to the year in which the award is made.

(3) The medal shall be presented at annual meetings of The Engineering Institute of Canada.

(4) A committee of five shall judge the papers entered for competition, all of whom shall be members of The Engineering Institute of Canada, and shall be appointed by the council of the Institute.

(5) All papers presented shall be the work of the author or authors and must not have previously been made public, except as part of the literature of The Engineering Institute of Canada.

(6) Should the committee not consider the papers presented in any one year of sufficient merit, no award shall be made, but in the following year, or years, the committee shall have the power to award the accumulated medals or to award a second prize in the nature of a silver medal, or a third prize of books to be selected by the committee.

(7) The medal shall be suitably engraved, containing the name of The Engineering Institute of Canada, and the words, "The Plummer Medal," together with the adopted design, and on the reverse side the name of the recipient, the date and any other inscription that may be decided upon by the committee.

THE T. C. KEEFER MEDAL

This medal was established by Council in 1942 to perpetuate the name of the first president of the Institute.

It is awarded for papers presented to the Institute during the year on *civil engineering subjects,* "civil" being used in the limited sense to indicate structural, surveying and construction work generally.

THE R. A. ROSS MEDAL

This medal was established by Council in 1942 to perpetuate the name of a past president of the Institute distinguished for work in the electrical branch of engineering.

It is awarded for papers presented to the Institute during the year on *electrical engineering subjects.*

THE CANADIAN LUMBERMEN'S ASSOCIATION PRIZE

A prize of $100.00 will be awarded by The Canadian Lumbermen's Association for the best paper presented in any year on the use of lumber or timber in construction; or on the use of wood, including wood waste, in the manufacture of useful products; or on the development of methods of treating wood to make it more resistive to destruction from decay, insects, marine organisms or fire; or in such other related subjects in wood utilization as may later be designed.

The following rules shall govern in the competition:

(1) The competition shall be open to all members of the Institute and to any bona fide resident of Canada.

(2) An award shall be made only if, in the opinion of the examiners, a paper has been presented for publication in the *Journal* of the Engineering Institute of Canada and/or in *Timber of Canada* of sufficient merit to justify the award.

(3) The award shall not be made oftener than once a year, and the prize year shall be from July 1st to June 30th.

(4) The award shall be made at the Annual Meeting of the Engineering Institute of Canada.

(5) A committee of five shall judge the papers entered for competition, all of whom shall be members of the Engineering Institute of Canada.

(6) All papers presented shall be the work of the author or authors and must not have been previously made public except as part of the literature of the Engineering Institute of Canada, or of the Canadian Lumbermen's Association. Proper credit shall be given in the papers for any assistance obtained from other parties or from other reports.

(7) Should the Committee not consider the papers presented in any one year of sufficient merit to justify a prize, no award shall be made, but in the following year or years the Committee shall have power to award accumulated prizes if papers of sufficient merit to justify prizes are presented.

(8) In the case of two or more authors presenting a paper, the amount of the prize shall be divided equally among such authors.

(9) For the first year the award shall be made for the best paper on the structural application of timber and/or plywood as for example—

  (1) Laminated structural wood members.

  (2) Composite wood and plywood structural members.

  (3) New ideas in the design of structural timber units.

Special consideration will be given to papers dealing with the application of low grade material to structural uses. (Approved by E.I.C. Council, June. 1944.)

PRIZES TO STUDENTS AND JUNIORS

(1) Five prizes may be awarded annually for the best papers presented by Students or Juniors of the Institute in the vice-presidential zones of the Institute, as follows:—

The H. N. Ruttan Prize,—
in Zone A—The four western provinces.

The John Galbraith Prize,—
in Zone B—The Province of Ontario.

The Phelps Johnson Prize,—
for an English Student or Junior in Zone C—The province of Quebec.

The Ernest Marceau Prize,—
for a French Student or Junior in Zone C—The province of Quebec.

The Martin Murphy Prize,—
in Zone D—The Maritime provinces.

(2) Awards shall only be made if, in the opinion of the examiners for a zone, a paper of sufficient merit has been presented to a branch in that particular zone.

(3) The winner of a prize shall be required to specify such technical books or instruments as he may desire to the total value of approximately twenty-five dollars when suitably bound and printed or engraved, as the case may be.

(4) The award of prizes shall be for the year ending June thirtieth. On that date, each branch secretary shall forward to the examiners for his particular zone all papers presented to his branch by Students and

(*Continued on page 586*)

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

September 20th, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate *

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the October meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ADAMS—ALBERT OLIVER, of Ottawa, Ont. Born at London, Eng., April 28, 1899. Educ.: B.Sc., (Elect.), McGill, 1926; D.I.C. (Aero.) Imperial College, London, 1929; Assoc. Fellow, Royal Aero. Society; 1915-17, dftsman., rodman, chainman, instru'man., C.P.R., Ottawa; 1919-20, jr. dftsman., Wayagamack Pulp & Paper Co.; 1920-25, dftsman., technician, stress analysis, on various jobs (1923, dftsman., jr. designer, Laurentide Air Services); with R.C.A.F., as follows: 1926-37, Tech. Officer i/c airworthiness section, 1938-39, C.O. No. 11 Tech. Detachment, Montreal, 1939-47, Director of Aero. Engrg. & Develop't., 1947-48, Chief Inspector, accidents, 1948-49, Deputy i/c Logistics, the above constitutes professional responsibility in structl. and non-structl. design, repair, overhaul, contractual control, logistical planning and analysis, etc.; 1949 to date, Deputy Controller General, Department of National Defence, Ottawa, Ont.

References: R. E. Jamieson, E. W. Stedman, A. L. James, A. Ferrier, J. H. Parkin, R. S. Eadie, C. V. Christie.

ANDERSON—CARL JOHAN, of Montreal, Que. Born at Hernosand, Sweden, July 7, 1888. Educ.: B.Sc., (General), Upsala Univ., Sweden, 1910; 1900-10, apprentice, machine shop drawing office during summer, Hernosands Machine Works 1911-13, dftsman., service engr., New Britain Machine Works, Conn.; 1913-16, experimental work on rifles and guns, Ross Rifle Factory, Quebec; 1916-17, machine shop foreman, Dominion Cartridge Co., Brownsburg, Que.; 1917-19, machine shop foreman and erection shipbldg., Quinlan Robertson, Quebec; 1920-28, machinist, inspector, foreman, C.N.R., Quebec; 1928-39, dftsman. and chief dftsman., duties of plant engr., C.N.R. shops, St. Malo, Quebec City; 1939-42, aircraft inspecn. and prod. methods, Dept. National Defence; 1942 to date, engr. of methods and operations, Robert Mitchell Co., Montreal.

References: S. E. Oliver, J. E. Dion, G. L. Wiggs, G. A. Johnson, J. G. Frost.

DUTTON—THEODORE SYDNEY, of Valois, Que. Born at Birkenhead, Eng., Oct. 18, 1913. Educ.: Matriculation, Birkenhead Institute Secondary School, 1930; 4 yrs. evening course, Regent Polytechnic, Final Exam. in Radio Communication, 1933; completed R.A.F. Officers' Radar Course, 1940; 1931-33, genl. clerical duties, tech. enquiries, Birkenhead Corp.; 1933-36, mfr's. radio service man, Gen. Elec. Co. (British), London; 1936-37, test and design engr. in receiving lab., participation in design and constrn. of specialized measuring apparatus, Baird Television Ltd., London; 1937-40, design, development and calibration of electronic measuring apparatus, suggested market scope for and personally designed and supervised production several electronic instruments having application in field of measurement, etc., etc., H. W. Sullivan, Ltd., London; 1940 (Mar. to Sept.), chief engr. charged with design and develop't possible under way conditions, Amplivox Ltd., London; Sept. 1940, Comm. in R.A.F. Radar Br., posted as C/O to Area H.Q.; 1943 (Mar. to Apr.), temporarily attached to Royal Navy at instance of British Minister of Supply to design special type of audio oscillator equipt.; 1944, (Feb. to June) returned to R.A.F. duties, made res. for electronic design and constrn. of comprehensive type of Radar trainer equipt., etc.; Sept. 1944, posted i/c develop't. on M.I.T. designed and U.S. mfg'd, G.C.A. equipt.; 1945, demobilized; 1945-47, chief engr., responsible for setting up research dept., initiating the design of new models, etc., Amplivox Ltd.; 1947, (June to Nov.), left above position, offered position as director and chief engr., new company which after months of preparatory work, fell through, due to lack of supplies; arrived in Canada in Feb., 1948.

References: W. R. Way, A. S. Runciman, J. Crawford, H. Abbott-Smith, G. R. Hale, L. A. Wright.

ELLWOOD—MICHAEL M., of Montreal, Que. Born at Petrokov, Russia, June 13, 1904. Educ.: Mech. Engr., University of Brunn, 1931; Skoda-Works Ltd., as follows: 1926, summer training aero-engine divn. (engine tests), 1928-29, designer, aero-engine factory, Warsaw, Poland; 1931-32, owner motor car repair shop, Prague; 1932-33, dftsman., Cirrus-Hermes Engrg. Co., Ltd., London, Eng. (aero-engines); 1933-34, machinery purchasing engr., Bata Shoe Co., Zlin; 1934-35, owner's asst. and sales engr., Behthold Kafka, machine tools, Brno (Brunn); 1935-38, mgr. aircraft control divn., "Kablo" Cable & Wire Rope Co., Ltd., Prague (Skoda Works); 1938-45, genl. mgr.'s asst., chief of dept. and demonstration engr., special vehicle divn., Skoda Works, Pilsen; 1945-46, tech. adviser, U.S. Military Gov't., Deggendorf, Bavaria, U.S. Zone of Occupation, Germany; 1946-47, managing-dir. and custodian, Suddeutsche Bau, G.M.B.H. Oil Refinery, Deggendorf, Germany, U.S. Zone; 1947-48, business analyst, property control branch, U.S. Military Gov't. in Germany; at present, test and research engr., engr. dept., Sicard Inc., Montreal, Que.

References: R. E. Jamieson, B. A. Burgess, R. Leduc, J. A. Lalonde, C. J. Pimenoff, J. B. Lavigueur, W. D. Laird.

FISHER—J. TAYLOR, of Toronto, Ont. Born at South Middleton, Ont., May 6, 1905. Educ.: B.A., McMaster, 1927; R.P.E., Ontario; M., A.I.E.E.; with Bell Telephone Co. of Canada, as follows: 1927-28, student engr., traffic dept., Montreal, 1928-33, engr., dial equipt., Montreal, 1935-38, engr., engrg. dept., Toronto, 1938-41, local equipt. and bldgs. engr., 1941-46, transmission practices engr., 1946-48, special studies engr., 1948 to date, special studies engr., plant extension divn., engrg. dept., Toronto, Ont.

References: F. G. F. Barr, G. L. Brooks, H. F. Bush, G. A. Caldwell, D. G. Geiger, W. G. Lloyd, J. E. McKinney.

GATES—FRED RUTTAN, of Winnipeg, Man. Born at Saskatoon, Sask., Oct. 31, 1915. Educ.: B.Sc., (Mech.), Saskatchewan, 1936; R.P.E., Manitoba; Canadian Westinghouse Co., Ltd., as follows: 1937-39, apprentice engr., U.S.A., 1939-40, section engr., domestic and industrial heating appliances; 1945 to date, asst. professor, mechanical engrg., University of Manitoba; also doing work as a consulting engr.

References: E. P. Fetherstonhaugh, A. E. Macdonald, W. F. Riddell, A. H. Pask, G. H. Herriot, N. M. Hall, A. A. Moline.

JAMIESON—JOHN KENNETH, of Sarnia, Ont. Born at Medicine Hat, Alta., Aug. 28, 1910. Educ.: S.B., (Business & Engrg. Adm.), M.I.T., 1931 (acc. E.C.P.D.); Univ. of Alta., 1926-28;

R.P.E., Ontario; with British American Oil Co., as follows: 1934-36, genl. foreman and plant engr., Coutts, Alta., 1936-37, asst. supt., Coutts, Alta., 1938, asst. to chief engr., Toronto, 1938-41, supt., Moose Jaw, Sask., 1942-44, asst. to Oil Controller for Canada, successively chief engr., genl. supt. of refineries, and mgr. of Refineries, B.A. Oil Co., Toronto; and at present, manager, engrg. and develop't. division, Imperial Oil Limited, Sarnia, Ont.

References: A. G. Farquharson, G. L. Macpherson, R. S. Dunlop, C. P. Warkentin.

ROBINSON—MORLEY RUSSELL, Capt., of Brampton, Ont. Born at Woodstock, Ont., Feb. 12, 1914. Educ.: Sr. Matric. Exams.; R.P.E., Quebec; 1940-42, Radar Mtce., British Army; 42-44, Wireless Mtce. Officer; 44-45, Line of Communications Officer; 1945-47, Telecommunication Workshop Officer; 1947 to date, Telecommunication Inspector—since 1942 served as Commissioned Officer in Canadian Army Active—during period in a position of responsibility in mtce. and repair of communication equipt., incl. radar and all types of army transmitters and receivers, etc., present appointment requires direct supervision of tech. inspection of all telecommunication equipt. used by Canadian Army in Central Command.

References: H. L. M. King, C. R. Boehm, J. W. Bishop, E. C King, W. S. Hunt, G. W. Thompson.

ROMANS—HEINRICH, of Montreal, Que. Born at Peterborough, Russia, Dec. 1, 1913. Educ.: Elect. Engineer, Univ. of Latvia, Riga, 1942; 1932, (summer), testing of elect. equipt., State Electrical Works, Riga, Latvia; 1933, (summer), winding of transformers and motors, Finnish Electric Ltd., Gottfried Stromberg, Helsinki, Finland; 1934 and 1937, (summers) iron foundry and rolling mill, Vitkovic Mining Ltd., Czechoslovakia; constrn. of transformer substations, Power Co. of Riga; 1939-41, asst. engr. construction of transformer stations and elect. sluice systems, Latvian Siemens-Schuckert Ltd., Riga; 1941-42, designer, high tension transformer stns., State Electrical Board, Latvia; Siemens-Schuckert Ltd., as follows: 1942-44, engr., later sr. engr., Riga, 1944-45, engr., designing of elect. systems, Brunswick, Germany; 1946-48, elect. and mech. engr., supv'ng. constrns. of elect plants, British Army Unit in Germany, R.E.; at present, elect. engr., designing switchboards, Bepco Canada Ltd., Montreal, Que.

References: S. H. Clarke, R. A. Yapp, A. K. Leuthold.

ROZMAN—DUSAN IVAN DRAGOTIN, of Charlottetown, P.E.I. Born at Ljubljana, April 13, 1903. Educ.: Engineer, Univ. of Kingdomof Serbs, Croats and Slovenes, Zagreb, 1926; with Royal Jugoslav Navy, as follows: 1928-33, genl. shop experience, Naval Arsenal, 1931-33, special task of introducing casting of steel and bronzes of high qualities in casting shop, 1933-37, checking of plans and specifications, checking new suggestions and inventions from outside the Navy, etc., (1936, on mission in Germany, supervising bldg. of motor torpedo boats for Navy), 1937-39, introducing and checking technical service on new boats, War Harbour Tivat, 1939-40, reorganizing Naval Trade School into High School, Director of Naval Trade School—Arsenal, 1940-41, head of control section, Naval Arsenal; 1944-45, chairman of steam boiler inspectors, head of mech. section of office for reconstrn. City of Ljubljana; 1946, chief clerk of UNRRA; 1947-48, designing engr., Teba, Lienz, Austria; 1948 to date, dftsman., grade 2, Dominion Department of Public Works, Charlottetown, P.E.I.

References: H. E. Miller, V. A. Ainsworth, A. G. Ley, C. W. Milton.

SAVORY—KENNETH CYRIL, of Duncan, B.C. Born at London, England, March 3, 1903. Educ.: City & Guilds (Engrg.) College, London, 1925-28—A.C.G.I., June 1928; A.M., Inst. Civil Engineers, London; R.P.E., British Columbia; 1928-29, asst. engr., Islas del Quadalquivir, Spain; 1929-31, asst. engr., Macdonald Gibbs & Co., London; 1933-37, asst. engr., St. Albans Waterworks Co.; 1937-42, res. engr., Sir Hugh Harley Dalrymple-Hay, M., I.C.E.; 1942-47, personal asst. to internal boards, River Great Ouse Catchmont Board; 1948, asst. to resident engr., H. G. Acres Co., Campbell River, B.C.; 1948-49, chief designer, Fraser Valley Dyking Board, Vancouver, B.C.; at present, personal asst. to vice-pres., B.C. International Engineering Co., Vancouver, B.C.

References: I. M. McIntyre, R. A. Cunningham, A. W. Lash, H. V. Serson, V. Michie.

TUCKER—GORDON RICHARD, of Thessalon, Ont. Born at Ilford, England, March 2, 1920. Educ.: B.Sc., (Engineering), Univ. of London, 1948; Student I.C.E., London; R.P.E., Ontario; 1939, (5 mos.), vacational training as dftsman. Dorman Long & Co., Ltd., London; 1940, (4 mos.), engrg. asst., W. & C. French Ltd., contractors, Woodford, Essex; 1941-45, Lieut. and finally Capt. in command of Company, R.E., military bridging, including Bailey Bridge, pontoon and assault, genl. field engrg., road constrn. handling mech., equipt. and explosives, etc.; 1948 to date, erection supervisor, supervising erection of Bailey Bridge form cage for main dam, tunnel develop't., Thessalon, Ont., consultg. engrg. division, H.E.P.C. of Ontario.

References: E. P. Muntz, G. E. Humphries, M. W. Huggins.

FOR TRANSFER FROM THE CLASS OF JUNIOR

GIROUARD—LAURENT JEAN BAPTISTE, of Montreal. Born at Montreal on March 11, 1916. Educ.: B.A.Sc. (C.E.) Ecole Poly. 1942; R.P.E., Que.; summers, 1938, surveying, Running Water Commission; 1939-40-41, surveying, field test, Road Dept., Provincial Laboratory; 1942-46, asst. to production mgr., Marine Industries Ltd., Sorel, 1946 to date, consulting engr., J. A. Lalonde & Co. (St. 1940. Jr. 1943)

References: J. N. Langelier, J. A. Lalonde, L. Letendre, H. Gaudefroy, E. Mackay, J. C. Chagnon, I. Brouillet.

HAMPTON—STANLEY JOHN, of Edmonton, Alta. Born at Warsaw, Poland on Oct. 29, 1922. Educ.: B.Sc. (Elect.), Alberta, 1946; R.P.E., Alta.; with the City of Edmonton as follows: 1946, Jr. elect. engr., electric light and power distribution dept.; to date, design and supervision of the underground network system, supervision of relay test, Edmonton. (St. 1946. Jr. 1943)

References: C. Z. Monaghan, R. E. Phillips, D. B. Menzies, J. D. A. Macdonald, W. Kirkland, J. E. Cranswick.

LAVIGUEUR—JOSEPH BERNARD, of Montreal, Que. Born at Montreal on March 1, 1918. Educ.: B.A.Sc. (C.E.) Ecole Poly. 1941; R.P.E., Que.; 1938-40, surveyor, Quebec Streams Commission; 1940-41, Dept. of Highways, Que.; 1941-45, Aeronautical eng. branch, R.C.A.F.; 1945 to date, chief engr., Sicard Inc., Mtl. (St. 1938. Jr. 1944)

References: J. A. Lalonde, H. Gaudefroy, J. E. Hurtubise, L. Cartier, T. A. Monti.

ONASIK—PETER, of Toronto, Ont. Born at Toronto on June 11, 1917. Educ.: B.Sc. (Civil), Univ. of Toronto, 1943; R.P.E., Ont.; with Cdn. Dredge & Dock Co. Ltd., as follows: 1942 (5 mos.) asst. field engr., tailrace excavation Beauharnois, Que.; 1943, asst. field engr., layout of dredging channels, placing of rip rap, sounding, general surveying; 1944-45, H.E.P.C. of Ont., Toronto Office, design engr., dftg. records, preparing Pondage—Peak Load Report; 1945-48 with Canadian Dredge & Dock Co. Ltd., on various contracts as follows: field engr. Clarkson—Laying outlet sewer into Lake Ont. for British American Oil Co.; Port Burwell, installing foundations, for cross-stream and 1-35 ft. loading coal conveyors for Valley Camp Coal Co.; Fort William, installing double runway for coal bridges, raising coal bridges from old to new foundations, Fort William Coal Dock Co.; Sarnia, layout of dock extension, lower dock, Imperial Oil Co. Ltd.; in above projects, responsible for engrg. layout for construction, kept costs, issued reports; still with Canadian Dredge & Dock Co., 1946, dredging supt. De Cew Falls Extension; 1947, field engr. Cdn. D. & D. Co., replacement of old dock—Imperial Oil Co.; 1947, pipe superintendent, Austin Construction Co. Sarnia, i/c of all pipe installation, Ettylene Glycol plant, sewers; 1948, site develop't, supt., Dow Chemical Co. of Canada, Sarnia; at present, asst. works engr. Hydro Electric Power Commission of Ont., doing general liaison work between head office and LaCave Power Develop't., expedition of materials, costs. (St. 1943. Jr. 1946)

References: D. B. Hillary, J. E. Harris, D. S. MacArthur, W. E. Bonn, R. H. Self.

AUGUST JOURNALS NEEDED

Owing to a heavy demand for copies of the August, 1949, issue of the *Journal*, the supply at Headquarters has been exhausted.

If you do not file your copy, will you please send it to:—

The Library,
The Engineering Institute of Canada,
2050 Mansfield Street,
Montreal.

Additional copies will then be available at Headquarters for future reference.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required as Sales Engineer by large diversified Chemical Company in Montreal. Applicants should have sales experience and ability to sell to senior executives. Knowledge of paint industry helpful. Age 30 to 40 years, preferably bilingual. Location Montreal. Salary commensurate with qualifications. Apply to File No. 1239-V.

CIVIL

CIVIL ENGINEER, recent graduate, required by Montreal firm. General construction duties. Salary open. Apply to File No. 1256-V.

ELECTRICAL

ELECTRONIC ENGINEER. Fully qualified. At least five years laboratory experience in circuit design and radio physics. Salary open. Apply to File No. 1243-V.

ELECTRICAL ENGINEER 35 to 40 years of age required in Toronto as sales engineer. Must be thoroughly experienced in the utility field. Salary open. Apply to File No. 1245-V.

ELECTRICAL ENGINEER age 25 to 35 years required in Toronto as Sales Engineer. Applicant will be required to cover industrial and jobbing trade in Ontario (except Ottawa) and must be thoroughly experienced in this field. Salary open. Apply to File No. 1245-V.

GRADUATE ELECTRICAL ENGINEER, age 25 to 35 years required as Field Representative for Ontario firm. Applicant will be required to travel half of time covering all of Canada. Will not be responsible for direct sales but will be calling on representatives and distributors, etc. Salary open. Apply to File No. 1245-V.

SUPERINTENDENT FOR ELECTRONICS LABORATORY required by Defence Research Board. Applicant should have post graduate training to Ph.D. level or equivalent, also considerable experience in directing research groups in Communications, Radar, Radio and Serromechanisms. Apply to File No. 1249-V.

ELECTRICAL ENGINEER, recent graduate required in Montreal. Salary open. Apply to File No. 1250-V.

RECENT GRADUATE IN ELECTRICAL ENGINEERING required as assistant supervisor of distribution. Duties would be under supervision. Location Ontario. Salary open. Apply to File No. 1253-V.

COMMUNICATIONS ENGINEER, maximum age 25, required by international aviation organization to work with technical secretariat. Preferably applicant with airline experience. Job requires ability to write reports and conduct meetings. Required to travel and to co-operate closely with other personnel. Salary open. Apply to File No. 1255-V.

MECHANICAL

SENIOR MECHANICAL ENGINEER required to supervise design of steam plant equipment, pressure vessels, plate work, structural steel and heavy machinery. Must have understanding of Canadian production and construction problems and able to deal with the public. Salary open. Location Western Ontario. Apply to File No. 1202-V.

GRADUATE MECHANICAL ENGINEERS required by Canadian University in Montreal for Sessional appointment as Instructors and Demonstrators for seven months from October 1st, 1949. Apply giving qualifications and salary required. Apply to File No. 1232-V.

MECHANICAL ENGINEER with ten to fifteen years experience required in Montreal. Applicant would be responsible for engineering problems throughout firms' Canadian Division, Halifax to the West Coast. Directly supervise maintenance crew in major production plant. Location Montreal. Salary open. Apply to File No. 1241-V.

MECHANICAL ENGINEER 35 to 45 years of age with knowledge of plumbing, heating and air-conditioning required in Ontario. Duties would be estimating, layout and designs with some supervisory and management duties. Salary from $200 to $350 to start. Apply to File No. 1247-V.

MECHANICAL ENGINEER required for layout and design of plumbing and heating equipment, location Montreal. Salary open. Apply to File No. 1252-V.

MECHANICAL ENGINEER required for Toronto office of a firm of Power House and Dust Collection specialties. Applicant should have experience in supervision and construction. Salary open. Apply to File No. 1258-V.

MECHANICAL ENGINEER, recent graduate, required in Montreal. Duties include draughting, building and piping layouts. Salary open. Apply to File No. 1259-V.

MISCELLANEOUS

PHYSICIST OR ELECTRICAL ENGINEER, with first class honours degree from a recognized university to assist in patent work, good knowledge of electronics required. Age under 30. Initial salary up to $4,000.00 depending on qualification. Apply to File No. 1225-V.

SALES ENGINEER, required by prominent distributor of heavy equipment for forestry, road building and construction industries. Head office in Montreal. Working knowledge of French and executive ability necessary. Salary open. Apply to File No. 1237-V.

SENIOR STRUCTURAL ENGINEER, required in Montreal. Must have extensive experience in both field work and design. Estimating experience would be valuable. Salary according to qualifications. Apply to File No. 1242-V.

FIELD ENGINEER required for Montreal area for concrete and steel structure. Would also be responsible for line and grade work on job also technical supervision of the work. Salary open. Apply to File No. 1242-V.

MECHANICAL ENGINEERS AND DESIGNERS, fully qualified. Accustomed to working with small electromechanical device. Location Ontario. Salary open. Apply to File No. 1243-V.

MECHANICAL OR ELECTRICAL ENGINEER, required for Junior position in production engineering division. Preferaby applicant with interest in hydraulics as applied to machine tools. Location Ontario. Salary $270.00 to $325.00 per month. Apply to File No. 1244-V.

GRADUATE ENGINEER, required by waterworks division of a Saskatchewan city to take charge of a field party and later to assist with the design of intake, filtration plant, pipe lines, etc. Salary open. Apply to File No. 1246-V.

RECENT GRADUATES WITH CIVIL OR MECHANICAL background required by industrial firm in Central Ontario. Salary open. Apply to File No. 1248-V.

MUNICIPAL ENGINEER wanted for Montreal suburb. Applicant should have experience in pavements, sewers, waterworks and general municipal operations. Salary open. Apply to File No. 1251-V.

PLANT ENGINEER required by New Brunswick rayon mill. Applicant should have ten to fifteen years experience in electrical maintenance and repair. Machine shop experience also necessary. Must be capable of taking over and directing staff. Salary open. Apply to File No. 1254-V.

AERONAUTICAL ENGINEER, not over 25 years of age, required by international aviation organization to work with technical secretariat. Applicant must have airline experience and ability to write reports and conduct meetings. Required to travel and to co-operate closely with other personnel. Salary open. Apply to File No. 1255-V.

INSTRUCTOR qualified to teach elementary physics required for staff of a technical college in New York State. Preferably applicant with a masters degree in physics or equivalent training and some teaching experience. Salary open. Apply to File No. 1257-V.

SALES ENGINEER, around 30 years of age, preferably electrical background and experience with utility or an electrical contractor or consulting firm. Should be familiar with transmission and distribution practice. Working knowledge of French. Location, Montreal. Salary open. Apply to File No. 1261-V.

ENGINEER OR PHYSICIST required by Canada's leading manufacturer of radio and electronic equipment. Preferably applicant with post-graduate degree, at least five years' experience advanced development or research on electrical circuits. Pulse experience preferred. Able to plan and direct an engineering group. Location, Montreal. Salary open. Apply to File No. 1262-V.

GRADUATES IN ELECTRICAL ENGINEERING OR PHYSICS required in an expanding research and development laboratory in Montreal. Applicants must have at least 3 years design and manufacturing experience on radio transmitters or radar equipment. Salary open. Apply to File No. 1262-V.

GRADUATE IN MECHANICAL ENGINEERING required by Canada's leading manufacturer of radio and electronic equipment in their research and development laboratory in Montreal. Applicants must have at least three years experience in mechanical design of radio transmitting or similar electrical equipment. Salary open. Apply to File No. 1262-V.

TECHNICAL WRITER, in engineering or science required by manufacturer of radio and electronic equipment in Montreal. Should have at least two years experience in writing instruction books for complex radio, radar or similar electrical equipment. Salary open. Apply to File No. 1262-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CIVIL

CIVIL ENGINEER eligible for registration in B.C., with post-graduate training in Public Health; preferably with experience in municipal or public health engineering. Candidates must be British Subjects under age of 45 except ex-service personnel, who are given preference. Salary $3,504 rising to $4,104 per annum. Apply to File No. 1206-V.

CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 1210-V.

CIVIL ENGINEER, recent graduate, required for general field duties by Montreal firm. Location near Montreal. Salary open. Apply to File No. 1228-V.

CHEMICAL

CHEMICAL ENGINEER, age 30 years, required by a pulp and paper company in the St. Maurice Valley. Preferably with some experience in a process industry with preference for kraft pulp manufacturing. Excellent opportunity. Salary open. Apply to File No. 1222-V.

ELECTRICAL

ENGINEER, electronics field, with considerable experience on inspection methods and organization. Salary $3,480 to $4,080 depending on qualifications. Position in Ottawa. Apply to File No. 1204-V.

ELECTRICAL ENGINEER, required with about eight years experience in charge of electrical maintenance and construction crews. This position is an opportunity for advancement. Location Ontario. Salary depends on experience. Apply to File No. 1221-V.

ELECTRICAL ENGINEERS, required for the frequency conversion division of a public utility in Ontario. Salary open. Apply to File No. 1235-V.

ELECTRICAL ENGINEER, with 3 to 5 years experience required by Steel Company in Montreal for design and layout of industrial installations and maintenance. Salary open. Apply to File No. 1236-V.

MECHANICAL

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicants should state age, experience and salary expected. Apply to File No. 1210-V.

MECHANICAL, CHEMICAL, ELECTRONIC AND ELECTRICAL ENGINEERS, ALSO GRADUATES IN ENGINEERING PHYSICS, required for armament research and development by a government establishment. Salaries open. Apply to File No. 1214-V.

MISCELLANEOUS

GRADUATE ENGINEER preferably mechanical or chemical required for sales engineering in the Toronto area. Should have some experience in sales and maintenance engineering. Salary open. Apply to File No. 1203-V.

ENGINEER, not over thirty-five years of age required by Canadian owned public utility operating in Bolivia. Must have at least 6 years experience in this field. Salary open. Apply to File No. 1205-V.

SALES ENGINEER required as Eastern Canadian Representative for an American firm. Applicant should be 35 years of age preferably a Mechanical Engineering degree. A few years experience in selling industrial rubber goods, would be an advantage. Territory Port Arthur to the coast. Salary open. Apply to File No. 1207-V.

SALES ENGINEERS required by large chemical manufacturer. Applicants should have a chemical background and some sales experience. These positions offer a wide scope in products sold, fields covered and opportunity of advancement. Location Montreal and southern Ontario. Salary open. Apply to File No. 1211-V.

ASSISTANT CHIEF ENGINEER required for Public Utilities Commission, Victoria, B.C. Candidates must be registered Professional Engineers in B.C. with at least ten years experience as a civil engineer or in an allied field, preferably in construction and operation of electric utilities and experience in public utility rate-making. Salary $4,884 rising to $5,484 per annum. Apply to File No. 1213-V.

GENERAL OPERATING SUPERINTENDENT, required by Maritime Public Utility. Applicant must be thoroughly experienced in operation and maintenance of overhead electric distribution system. Salary open. Apply to File No. 1215-V.

GRADUATE ENGINEER, preferably with training in engineering physics, or civil engineer, for several years work in the United Kingdom on defence problems. Applicant must have some knowledge of building construction. Age range 25-35 years. Salary open. Apply to File No. 1216-V.

SALES ENGINEER, age 30 to 40 years, required in Ontario for sales of anti-friction bearings. Experience in this field preferred. Salary open. Apply to File No. 1219-V.

SALES ENGINEER, required by manufacturer and exporters of forest products to promote the use and knowledge of their products to engineers, architects, contracting and purchasing agents of large industrials. Must be bilingual. Salary open. Apply to File No. 1220-V.

GRADUATE ENGINEER, with draughting and design experience on reinforced concrete, structural steel and conveying equipment. Field construction experience valuable but not absolutely necessary. Location Montreal. Salary open. Apply to File No. 1224-V.

GRADUATE ENGINEER, required for post of Superintendent of Calgary Transit System. The system is being converted from street car to trolley coach and motor bus operation. Applicants to furnish full particulars of experience and qualifications. Salary open. Apply to File No. 1226-V.

ARE YOU A KEEN TYPE? Can you discuss technical problems at a high level? Have you a car with which you could cover the Province of Quebec to sell air filtration and silencing equipment for a British manufacturer who believes that the prospects are unlimited for the right man. It will be better if you are bilingual and thoroughly familiar with all types of prime movers and power equipment. If you believe you can meet exacting standards send complete details to File No. 1229-V.

SALES ENGINEER, with some interest in mechanical design work required in Montreal. Mechanical design would consume small portion of applicants time, sales would be on industrial blower equipment and polythene plastic tubing. Salary open. Apply to File No. 1230-V.

DESIGN ENGINEER required for development work on aircraft cabin supercharging and air conditioning equipment. Location Montreal. Salary open. Apply to File No. 1230-V.

CIVIL OR MECHANICAL ENGINEER, required for position of assistant shop superintendent in large structural steel fabricating plant in Montreal. Salary open. Apply to File No. 1231-V.

MECHANICAL AND CHEMICAL ENGINEERS, required by Montreal firm manufacturing roofing products, etc., for training period. Salary open. Apply to File No. 1233-V.

Situations Wanted

CHEMICAL ENGINEER, McGill, M.E.I.C., C.P.E.Q., married, age 36, perfectly bilingual, seeks position with possibilities for active and personal interest with established manufacturing, contracting or consulting firm in executive or professional position. Preferably in Montreal or vicinity. Nine years continued service with present employes. Presently as Plant and Projects Engineer. Wide trade connections, engineering and administrative experience on operation project studies and all stages of realization: layout, equipment specifications and design field administrations, procurements on wartime and recent projects. Apply to File No. 6-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., University of Saskatchewan, 1941. Age 31. Experience in mechanical inspection, production, draughting, checking, mechanical design, familiar with shop methods, working knowledge of work simplification. Desire change as opportunity for advancement limited, willing to learn and will consider any type of work with reliable concern, not adverse to travel. Available upon four weeks notice. Apply to File No. 41-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., requires a part time position in the City of Hamilton with a consultant of reinforced concrete and structural steel. Interested in designing, checking or draughting. Will be available evenings and week-ends. Apply to File No. 43-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Alberta. 34 years of age. Married. Veteran R.C.E. Have held the following positions: Instrumentman on airport construction, road and concrete materials assayer and inspector, superintendent on road construction program, assistant engineer in design office dealing in building design, timber, concrete and steel, superintendent in complete charge of building project. Wish to contact contractor (preferably in building construction) or consultant firm in Western Provinces. Available on reasonable notice. Apply to File No. 46-W.

ELECTRICAL AND MECHANICAL ENGINEER, graduate of Australian University B.E. (Hons.) A.M.I.E., (Aust.) 27 years. Single. 6 years experience including electrical design layout, illumination, auxilliary plant, mechanical design, maintenance, supervision and production. Seeking experience and possible opportunity for post graduate study over period of 5 years or more. Apply to File No. 59-W.

MECHANICAL ENGINEERING GRADUATE, Jr.E.I.C., 1947. Four years varied experience which includes: instrument man on dam construction and city engineering; power plant operation, substation construction and maintenance, instrumentation and maintenance engineer in chemical plant. Apply to File No. 60-W.

ELECTRICAL ENGINEER, S.E.I.C., A.I.E.E., B.Sc., in E.E. (Power Option) University of New Brunswick, 1949. Service with R.C.A.F., 3 years as Aircraft Electrician. Summer work with Northern Electric as Dial Installer. Age 25. Single. Bilingual. Desires work in power or sales. Available now. Will work anywhere. Apply to File No. 79-W.

ELECTRICAL ENGINEER, Associate I.E.E. Age 52. Married. 5 years pupil in English Plant. 15 years supervising estimating and technical correspondence department of leading English manufacturers of power transformers and capacitors. 5 years with manufacturers' association. Library, technical writing and advertising experience. Presently located in Southern Ontario. Apply to File No. 81-W.

GRADUATE ELECTRICAL ENGINEER AND LAWYER, B.Eng., 1937, McGill, B.C.L., 1949, McGill, M.E.I.C. Age 35. Married. Ten years service with national electrical concern as Sales Engineer. Three years in R.C.A.F., as aeronautical engineer. Also took R.C.A.F. signals course. Position desired in industrial concern, preferably in administrative capacity where engineering experience and legal background would be an asset. Location immaterial. Available immediately. Apply to File No. 120-W.

REG. PROF. ENG. in Province of Ontario and Quebec, M.E.I.C., fully employed desires part time consulting and design work in field of factory modernization including conveyorization, ventilation, heating, compressed air, production methods, jig and fixture design. Has various experience in mechanical aeronautical and furniture fields. Apply to File No. 140-W.

CIVIL AND ELECTRICAL ENGINEERING GRADUATE, M.E.I.C., with past experience covering engineering and building construction and maintenance, shop operation, heavy construction machinery sales and service. Past several years in managerial capacity. Seeks suitable change with greater responsibility in engineering or business. Apply to File No. 1266-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C. Background of Engineering; Production, business organization, cost control and management. Age 36. 10 years experience. Married. Bilingual. Would prefer permanent association with firm in Montreal area. Would consider association with fellow engineer to start in manufacturing or other sphere of activity. Some capital available and a few projects in mind. Apply to File No. 1782-W.

CHEMICAL ENGINEERING GRADUATE, M.E.I.C., McGill University, 1938. Age 36. Ten years experience including fine chemical production, plant operation and costing, industrial development surveys, raw material supply, planning and purchasing materials for plant construction and operating, plant and office organization. Available immediately. Apply to File No. 1947-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng., (Ont.). Married. Presently employed. Seven years experience in Canada and the United States. Designing and supervising the installation and operation of heating, ventilating, air-conditioning, refrigeration and dust collecting systems. Desires to improve position. Prefer Southern Ontario or Western Canada. Apply to File No. 2172-W.

ENGINEERING GRADUATE, M.E.I.C., B.A., M.Sc. Married. Age 52. Bilingual. Experience: 13 years teaching Chemistry, Minerology, Geology, 9 years as Mineralogist. Contemplates change soon for association with mining organization in consulting capacity. Please submit propositions to File No. 2663-W.

MECHANICAL ENGINEER, Jr.E.I.C., Saskatchewan, 1946. Age 24. Married, one child. Over two years experience in Pulp and Paper Mill engineering, including design, supervision of construction, and executive reports. Available on two months notice for any interesting job which offers good experience and advancement according to merit Will give serious consideration to any type of work except sales. Location unimportant. Apply to File No. 2795-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng., 1944. Age 28. Bilingual. Experience as follows: Demonstrator in Department of Mechanical Engineering at leading University for one term. Also experience in large mass production outfit in following departments: Cast iron foundry, dry milling cast iron, oil milling, punch and die, screw, heat treating, forge, polishing, nickel and chrome, paint spray, assembly, tool room and production engineering department, etc. Prefers work on design and development of mass production industrial automatic machinery or any other interesting opportunities. Available after October 1. Apply to File No. 2882-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44. 7 years industrial experience, production supervision, planning, scheduling, specifications, incentive systems, methods, estimating, cost analysis, business experience, welding application and metallurgy, manufacture of equipment for chemical production industry. Desires position technical representative, sales, executive assistant, production manager. Available 3 to 4 weeks. Apply to File No. 2920-W.

MECHANICAL ENGINEER, Jr.E.I.C. University of Saskatchewan, 1944. Age 27 married. Experienced in supervision of maintenance and construction in the paper industry and the textile industry. Desires position with responsibility and opportunity for advancement. Apply to File No. 2928-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc Queens, age 32, married, veteran, navy engineer officer. Experience primarily includes heating and power plant design, estimating, construction, and maintenance. At present employed but desires change to responsible position in Ontario, British Columbia or Alberta. Apply to File No. 3020-W.

GRADUATE DRAUGHTSMAN DESIGNER, S.E.I.C., B.Eng. Desires a position in the structural design field, preferably reinforced concrete detailing and design. Age 23. McGill, (Civil) graduate, 1948. More than a year's experience in structural steel and reinforced concrete detailing and design. Prefer employment in Montreal area, will consider good position elsewhere. Presently employed. Available on short notice. Apply to File No. 3026-W.

SALES ENGINEER; chemical engineer graduate, S.E.I.C., Laval '48. B.A., Sc., P.Eng. Age 26, single. Bilingual. Desirous of obtaining a position as Sales Engineer, preferably in the Province of Quebec for a chemical or heating and ventilating firm. Available immediately. Apply to File No. 3064-W.

ELECTRICAL ENGINEER, Jr.E.I.C. 2½ years technical, Officer in Army, 3 years varied industrial experience, including production planning and control work, simplification and cost accounting. Courses completed in business administration. Interested in Sales work. Desires position with small or medium size company. Apply to File No. 3181-W.

CIVIL ENGINEER, Student Member I.C.E., B.Sc. (Hons.), (London), ex-R.E.M.E. Captain, fluent French, Spanish, German. Experience England Switzerland, Spain, France, Egypt. At present working in Paris, seeks post as European representative of Canadian plant manufacturer. Willing to work first with firm in Canada to learn products. Apply to File No. 3215-W.

CIVIL ENGINEER, S.E.I.C., B.Sc., Alberta (1949). Age 30. Married, veteran. Desires employment in town planning and municipal field. Experience in surveying. Available on reasonable notice to present employer. Apply to File No. 3223-W.

MECHANICAL ENGINEER, B.Sc., Grad I.M.E., 2 years Engineer Officer; one year steam turbine research. Anxious to obtain suitable position in Canada in research, design or teaching fields. Expecting to be in Canada around September, 1949. Apply to File No. 3229-W.

CIVIL ENGINEER, M.E.I.C., interested in obtaining spare time employment. Four years experience in reinforced concrete and steel constructions covering design, supervision and surveying. Available evenings and week-ends. Presently located in Montreal. Apply to File No 3232-W.

ELECTRICAL ENGINEER, S.E.I.C., A.P.I., B.Sc. (E.E.) University of Saskatchewan, 1949. Age 25, married. Experience includes electrical contracting, wireless and radar in R.C.A.F. and maintenance of hydro plant. Desire employment in transmission or distribution. Apply to File No. 3238-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C. Desires position in pulp and paper mill for mining. Two year pregraduation bench work in machine shops toolmaking and light metal manufacturing. 16 months as tool and process engineer for Westmount tool-works. D.I.L. 8 months as telephone equipment engineer. 6 months designing structure for auto-plane company, Dorval. 16 months with Dominion Engineering as process engineer for manufacture of diesel engines. Since March, 1947, have been employed doing plant and production layouts for a pulp mill. This has involved structural design, reinforced concrete, foundations, pumps and piping and conveyors, machine design and general process layouts. Apply to File No. 3240-W.

APPOINTMENTS: HYDRAULIC BRANCH — PUBLIC WORKS DEPARTMENT GOVERNMENT OF KENYA

APPLICATIONS are invited for the following appointmen's on Four-Year contract terms; they should be submitted, accompanied by copies of testimonials and details of experience and qualifications to the Acting Director of Public Works, P.O. Box No. 662, Nairobi, Kenya.

I. ENGINEERS (HYDROLOGY)

Canadiadtes should have had experience with surface and sub-surface water supplies, particularly in hydrology and hydrographic survey together with some geological training. They should hold a degree in Civil or Mining Engineering or be Corporate Members of the Institution of Mining and Metallurgy or the Institution of Civil Engineers.

Salary Scale: **£655: £655: £725 by £35 to £760: £830 by £35 to £1,005 by £45 to £1,320 per annum.**

II. ENGINEERS (HYDRAULIC)

Candidates should have had experience with surface water supplies together with some geological training. They should hold a degree in Civil Engineering or be a Corporate Member of the Institution of Civil Engineers or hold equivalent qualifications.

Salary Scale: **£655: £655: £725 by £35 to £760: £830 by £35 to £1,005 by £45 to £1,320 per annum.**

III. ENGINEERS-GEOLOGIST

Canditidates should have an University Degree in which geology was taken as a major subject. Preference will be given to candidates who are Fellows of the Geological Society and/or who are qualified Mining Engineers and who have geophysical experience.

Salary Scale: **£690: £690: £760: £830 by £35 to £1,005 by £45 to £1,320 per annum.**

IV. ENGINEER—MOMBASA WATER SUPPLY

Candidates should have had experience with surface and sub-surface water supplies together with some geological training and must have had experience in the operation and maintenance of township water supplies including purification and sterilization of the water. They should hold a Degree in Civil Engineering or be a Corporate Member of the Institution of Civil Engineers or hold equivalent qualifications.

Salary Scale: **£655: £655: £725 by £35 to £760: £830 by £35 to £1,005 by £45 to £1,320 per annum.**

V. ENGINEER—RICE MISSION—RECONNAISSANCE SURVEY

Candidates should have had experience with surface and sub-surface water supplies, in particular on the investigation, design and execution of irrigation projects together with some geological training. They should hold a Degree in Civil Engineering or be Corporate Members of the Institution of Civil Engineers or hold equivalent qualifications.

Salary Scale: **£655: £655: £725 by £35 to £760: £830 by £35 to £1,005 by £45 to £1,320 per annum.**

THE TERMS AND CONDITIONS OF SERVICE INCLUDE:

(a) Free passage from place of appointment to Kenya, and to place of appointment on the completion of the contract; in the case of a married officer with dependant children under 21, passages are provided up to the cost of three adult passages.

(b) Eighteen days local leave per annum, and vacation leave on full pay on the termination of the contract at the rate of four-and-half days for each completed month of service.

(c) When in occupation of Government Quarters, 10% of salary is charged as rent when the quarters are furnished and 7½% of salary when they are unfurnished; when an officer occupies private quarters, he may claim an allowance up to the maximum of the amount by which the rent exceeds 10% of his salary when the quarters are furnished, or 7½% when they are unfurnished.

(d) Free medical treatment by the Government Medical Service for the officer, his wife and children.

(e) Gratuity at the rate of 15% of 9/10ths of the total salary drawn over the period of the contract will be paid on the termination of the officer's vacation leave.

(f) Points of entry into the salary scales will be determined by qualifications and experience.

THE CURRENT OFFICIAL RATE OF EXCHANGE IS $4.0275 TO THE £.

RULES GOVERNING AWARD OF INSTITUTE PRIZES

(Continued from page 580)

Juniors during the prize year, regardless of whether they have been read before the branch or not.

(5) The prizes shall be awarded only to those who are in good standing as Students or Juniors of the Institute on June thirtieth following the presentation of the paper.

(6) The papers must be the bona fide production of those contributing them and must not have been previously made public or contributed to any other society in whole or in part. It is to be understood, however, that a paper which has won or been considered for a branch prize is nevertheless eligible for the Institute Prize. No paper shall be considered for more than one of the five prizes.

(7) The examiners for each zone shall consist of the vice-president of that zone and two councillors resident in the zone, appointed by council. In the case of Zone C, two groups of examiners shall be appointed under the two vice-presidents, one for the English award and one for the French award. The awards shall be reported to the annual meeting of the Institute next following the prize year, and the prizes presented as soon thereafter as is reasonably possible.

PRIZES TO UNIVERSITY STUDENTS

In 1930 Council established eleven cash prizes of twenty-five dollars each for competition among students of Canadian engineering schools, in the year prior to the graduating year. Awards are now made annually to the following institutions:

University of Alberta
University of British Columbia
Ecole Polytechnique, Montreal
Laval University, Quebec
University of Manitoba
McGill University
University of New Brunswick
Nova Scotia Technical College
Queen's University
University of Saskatchewan
University of Toronto.

It is the desire of council that the method of their award shall be determined by the appropriate authority in each school or university, so that a prize may be given to the student in any department of engineering who has proved himself most deserving, not only in connection with his college work, but also as judged by his activities in the student engineering organization, if any, or in the local branch of a recognized engineering society.

It is not necessary for the recipient to belong to the Institute, and in this respect the prizes are quite distinct from those offered to Students and Juniors of the Institute, or from the prizes which are offered by a number of our branches to the Students attached to them.

It is felt that the establishment of these prizes not only aids deserving students, but assists in developing their interest in engineering societies' work, and in the resulting acquirement and interchange of professional knowledge.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS. PAPERS:

Hot Cathode Thyratrons: Practical Studies of Characteristics, *H. deB. Knight.*

Explains the significance of the various current and voltage ratings specified for a particular design; these are related to the life required of the valve. The design of valves of this type has to be largely empirical. The separate electrodes, the filling and the envelope are discussed from the point of view of features determining choice of types and of design.

Lightning Surges on the British Grid System, *J. S. Forrest.*

Analyzes the faults due to lightning that have occurred during fourteen years on the 5900 miles of line. The fault rate varies approximately inversely with the system voltage. It is estimated that there is only one fault due to a direct stroke in about seventy years. Protective devices are described, and use of radio methods for warnings is discussed.

Phase-and-Neutral System of Supply for Rural H.V. Distribution, *G. T. Garwood and G. J. Websdale.*

This paper advances the merits of the phase-and-neutral system of single-phase H.V. distribution. It considers the problems arising out of the application of the phase-and-neutral system in supply areas where there is no neutral conductor available for the connection of phase-and-neutral spurs.

Study of Frequency Fluctuations in Sound Recording and Reproducing Systems, *P. E. Axon and H. Davies.*

Concerned primarily with comparatively slow variations arising in disc recording systems. These fluctuations are difficult to eliminate, and this paper describes apparatus for measuring them. Outlines the methods evolved in understanding the results.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Barrages et Canalisations:
J. Aubert, Paris, Dunod, 1949. 558 pp., illus., pajco.

Canada, Eight Census of Canada; volume IX; Housing:
Dominion Bureau of Statistics. Ottawa, King's Printer, 1941. 372 pp., cloth.

Chauffage et Rafraîchissement Combinés des Habitations; 2d ed:
C. Boileau. Paris, Dunod, 1949. 201 pp., illus., paper.

Communication Circuits; 3rd ed:
Lawrence A. Ware and Henry R. Reed. New York, Wiley; London, Chapman & Hall, 1949. 403 pp., illus., cloth.

Constructive Uses of Atomic Energy:
Samuel K. Allison and Others, edited by S. C. Rothmann. New York, Harper, c1949. 258 pp.,illus., cloth.

Conveyors and Related Equipment; 2d ed:
Wilbur G. Hudson. New York, Wiley; London, Chapman, c1949. 468 pp., illus., cloth.

Differential Equations; 2d ed:
Harry W. Reddick. New York, Wiley; London, Chapman, c1949. 288 pp., cloth.

Electric Circuits and Machines:
B. L. Robertson and L. J. Black. New York, Toronto, Van Nostrand, 1949. 434 pp., illus., cloth.

Eléments de Construction à l'Usage de l'Ingénieur; Tome III, Organes de Transmission du Mouvement Circulaire, 1re partie, Arbres, Paliers, Supports de Paliers, Accouplements d'Arbres et Embrayages:
R. Prudhomme and A. L. Tourancheau. Paris, Dunod, 1949. 156 pp., illus., paper.

Elements of Strength of Materials:
S. Timoshenko and Gleason H. MacCullough. New York, Van Nostrand, 1949. 426 pp., illus., cloth.

Fraisage; 5th ed:
J. Hanen. Paris, Dunod, 1949. 207 pp., illus., paper.

Fundamentals of Civil Engineering:
John K. Minasian. Los Angeles, School of Applied Engineering, 1945. illus., paper.

Hydrology:
C. O. Wisler and E. F. Brater. New York, Wiley; London, Chapman, c1949. 419 pp., illus., cloth.

Higher Algebra for the Undergraduate:
Marie J. Weiss. New York, Wiley; London, Chapman, c1949. 165 pp., cloth.

How to run a meeting:
Edward J. Hegarty. New York, McGraw-Hill, c1947. 222 pp., cloth.

Influence of Certain Factors on the Performance of Shell-type Boilers.
Compiled by E. G. Ritchie. London, British Coal Utilisation Research Association, 1948. 152 pp., illus., paper.

Installations Electriques à Haute et Basse Tension:
A. Mauduit. Paris, Dunod, 1949. 433 pp.. illus., pajco.

Introduction to Radiochemistry:
Gerhart Friedlander and Joseph W. Kennedy. New York, Wiley; London, Chapman, 1949. 412 pp., illus., cloth.

Jet Propulsion Turbojets:
Volney C. Finch. Millbrae, California, National Press, c1948. 326pp., illus., cloth.

Management Planning and Control:
Billy E. Goetz. New York, McGraw-Hill, 1949. 294 pp., cloth.

Modern Railroad Structures:
Charles P. Disney and Robert F. Legget. New York, McGraw-Hill, 1949. 213 pp., illus., cloth.

Principles and Practice of Prestressed Concrete:
P. W. Abeles. London, Crosby Lockwood, 1949. 109 pp., illus., pajco.

Principles of Electricity; An Intermediate Text in Electricity and Magnetism:
Leigh Page. New York, Van Nostrand, c1949. 619 pp., illus., cloth.

Psychology of Invention in the Mathematical Field:
Jacques Hadamard. Princeton, Princeton University Press, Toronto, Saunders, 1949. 145 pp., cloth.

Radioactivité et Physique Nucléaire:

James M. Cork. Paris, Dunod, 1949. 324 pp., illus., pajco.

Structural Design in Wood:

Charles Mackintosh. Los Angeles, School of Applied Engineering, 1946. 100 pp., illus., paper.

Temperature and Human Life:

C. E. Winslow and L. P. Herrington. Princeton, Princeton University Press; Toronto, Saunders, 1949. 272 pp., illus., cloth.

Tin: Its Mining, Production, Technology, and Applications; 2d ed.

C. L. Mantell, New York, Reinhold, 1949. 573 pp., illus., cloth.

Traité de Mécanique Générale et Appliquée; Tome 1, Mécanique générale des Systèmes Matériels. Exposé des Théorèmes Fondamentaux:

A. Tenot and P. Chilon. Paris, Dunod, 1949. 499 pp., illus., paper.

Traité Théorique et Pratique des Engrenages; Tome 1, Théorie et Technologie.

G. Henriot. Paris, Dunod, 1949. 351 pp., illus., pajco.

PROCEEDINGS, TRANSACTIONS, ETC.

American Society of Civil Engineers:

Index to Transactions; Volumes 100 to 112. (1935 to 1947).

National Research Council of Canada. Associate Committee on the National Building Code:

Proceedings of the 1949 Building Officials Conference.

Ontario. Department of Mines:

General Index to the Reports of the Department; Volumes 36 to 49. (1927-1940).

TECHNICAL BULLETINS, ETC.

Alberta. Research Council of Alberta. Report:

No. 53—The role of very Fine Mineral Matter in the Hot Water Separation Process as Applied to Athabaska Bituminous Sand, K. A. Clark and D. S. Pasternack.

American Society for Testing Materials. Technical Publications:

No 88—Symposium on Industrial Gear Lubricants.

California Institute of Technology. Industrial Relations Section:

Circular no 16—The Job of Management at the Supervisory Level. Waldo E. Fisher.

Harvard University. School of Graduate Engineering. Publications:

No. 462—Three Remarks on the Theory of the Ideal Plastic Body, R. V. Mises. No. 463—Electron Gun as Illuminator for Electron Microscopy. R. Rudenberg. No. 464—Some Epimiological and Biological Problems in Water-Borne Amoebiasis, Shih L. Chang.—No. 465—An Initial Value Problem for a Class of Equations of Mixed Type, Stefan Bergman.—No. 466—Frequency of Minor Floods, Harold A. Thomas.

Institute of Metals. Journal Reprints:

Vol. 75—Part 8—Mechanism of Creep in Metals, G. R. Wilms and W. A. Wood.—The Creep Strength at 200 degrees C. of Some Magnesium Alloys Containing Cerium, G. A. Mellor and R. W. Ridley.—Effect of Rolling and Annealing Procedures on the Structure and Grain Size of Aluminium-Copper-Magnesium Alloy Strip, R. Chadwick and Others.—Fundamental Characteristics of Casting Fluidity, V. Kondic and H. J. Kozlowski. — Influence of Over-Ageing and Annealing on the Hardness and Microstructure of an Aluminium Alloy to British Standard Specification L 42, W. Betteridge and Others.

Iron and Steel Institute. Special Report:

No. 41—Corrosion of Iron and Steel by Industrial Waters and its Prevention. —No. 42—Report on the Bessemer Process.

National Research Council of Canada:

Index to Proceedings Rotterdam Soil Mechanics Conference, 1948.

Purdue University. Engineering Experiment Station Research Series:

No. 107—Research Activities for the Session of 1947-48.

U. S. Highway Research Board. Bibliography:

No. 6—Mineral Aggregates.

...Research Report no 4B-1948 Supplement:

Airport Runway Evaluation in Canada.

University of California. Department of Geological Sciences. Bulletin:

v 28, no. 5, pp. 91—136. Thermodynamics of a Magnetic Gas Phase, Jean Verhoogen.

STANDARDS

American Institute of Electrical Engineers:

American Standard for Pool Cathode Mercury-Arc Power Converters—ASA—C34.1-1949.

American Society for Testing Materials:

Specifications for Rolled Structural Steel. May 1949.

British Standards Institutions. Standards:

British Standards for Steel and Steel Products; Handbook no. 10, 1949.

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Farm and Horticultural electrical Installations. CP(B) 869.

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Ball and Roller Bearings:

P. H. Billington. Manchester, Emmott, c1949. Mechanical World Monograph.

Facts to Know about Pressure Atomising Oil Burners:

Warden King Ltd, Montreal, 1949.

Holland Tunnel Chemical Fire:

National Board of Fire Underwriters, New York, 1949.

Lake Charles Traffic Survey:

Louisiana Department of Highways and Local government Units, 1947.

Life Insurance Fact Book:

Institute of Life Insurance, New York, 1949.

Professional Guide for Junior Engineers:

W. W. Wickendon Engineers' Council for Professional Development, New York, c1949.

Soil-Cement Mixtures; Laboratory Handbook:

Portland Cement Association, Chicago, 1946.

Solderless-Type Wire Terminals:

T. C. Freedom. Reprint from Electrical Manufacturing, May 1949.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

ALLOY STEELS; THEIR PROPERTIES AND INDUSTRIAL APPLICATION:

J. Winning. Manchester, Emmott, 1948. 72 pp., illus. 7 x 5 in., paper, 2/6–. (Mechanical World Monograph No. 49).

The author's purpose is to condense, and to some extent explain, the underlying principles upon which the engineering applications of alloys are based. The discussion has been confined in the main to standard specifications, and treats of structural steels, carburizing steels, tool and special-purpose steels, stainless and heat-resisting steels, and the machinability of steel.

BIBLIOGRAPHY ON PRECISION INVESTMENT CASTING BY THE LOST WAX PROCESS:

Engineering Societies Library, New York, 1949. 15 pp., 11 x 8½ in., paper, $2.50. (E.S.L. Bibliography No. 3).

This is an annotated list of 111 references to books and articles up to early 1949. Theory, design problems, specific industrial applications, and factory and production methods are all covered. Short, descriptive articles and patent references have been omitted. Some historical references have been included to give a review of the application of this process to art and dental work.

BRITISH STANDARDS INSTITUTION. STANDARDS:

BS 771:1948—Synthetic Resin (Phenolic) Moulding Materials. 5/–.

Based on statistical principles. Specifies mandatory requirements for tensile strength, impact strength, surface resistivity, volume resistivity, heat resistance, power factor and permittivity for eight types of moulding materials. Optional requirements are also specified.

BS 1493:1948—Polystyrene Moulding Materials. 2/–.

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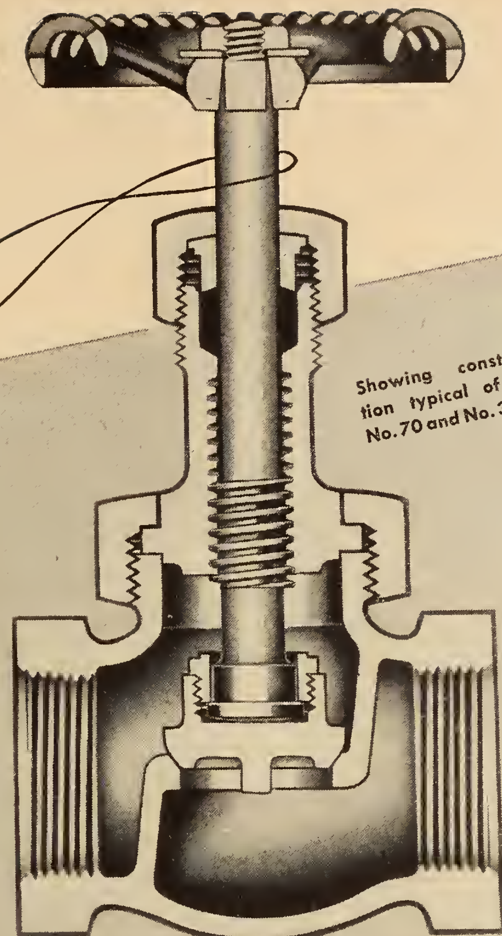

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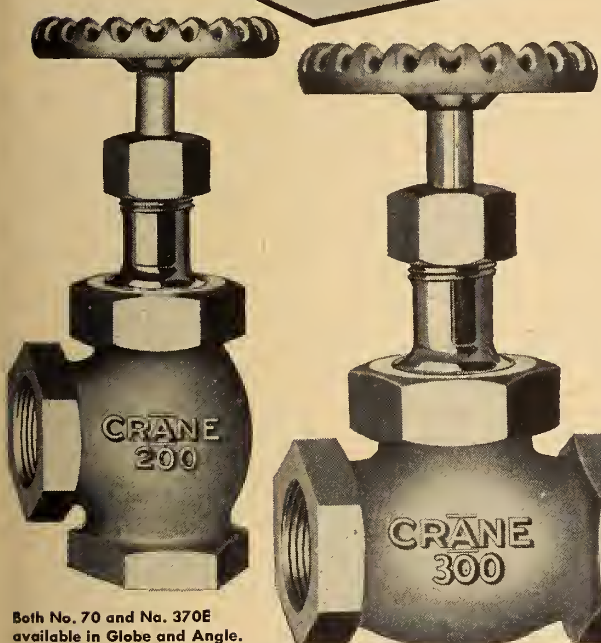

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General requirements in respect of materials and workmanship are stated in Part One. Tables of dimensions and specific requirements are included in Part Two.

BS 1499:1949—General Guidance in Sampling Non-Ferrous Metals. *1/-.*

Applies to all non-ferrous metals sampling methods of which are not included in separate British standards.

BS 1524:1949 — Cellulose Acetate Moulding Materials. *3/-.*

Defines basic values for the properties of cellulose acetate moulding materials and specifies the evidence which will be accepted as indicating conformity with those basic values. Specifies methods of test and qualifying requirements for the physical properties of three grades of material which are distinguished by difference softening points.

FILM IN INDUSTRIAL SAFETY TRAINING:

P. R. Ignatius. Boston, Harvard University Graduate School of Business Administration, 1949. 119 pp., 8¼ x 5½ in., paper, $1.50.

This project has been carried on as a part of the visual aids research programme at the Harvard Business School. Its purpose is to determine the extent to which films and other training aids are employed by industry, and the opportunities for their more effective and widespread use. This study not only deals with certain major technical problems but also relates these problems to the broad field of audio-visual training aids.

FLOW-LINE PLANNING IN FACTORY LAYOUT:

M. M. Harman. Manchester, Emmott, 1948. 32 pp., illus., 6½ x 4 in., paper, 2/-. (Mechanical World Monograph No. 48).

The flow line is the basis of all factory planning and this little book endeavours to give a résumé of current flow line practice together with a few detailed notes on the subject of plant layout.

NUMERICAL CALCULUS:

W. E. Milne. Princeton, N.J., Princeton University Press; Toronto, Saunders, 1949. 393 pp., illus., 9¼ x 6¼ in., cloth, $5.75 in Canada.

The aim of this book is to aid in bridging the considerable gulf between classroom mathematics and the numerical applications. It is designed to provide rudimentary instruction in such topics as solution of equations, interpolation, numerical integration, numerical solution of differential equations, finite differences, approximations by Least Squares, smoothing of data, and simple equations in finite differences. The presentation is elementary enough for any one with some knowledge of calculus and differential equations to read it understandingly.

PROCEEDINGS OF THE NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS, Volume 2:

Armour Research Foundation and Graduate School of the Illinois Institute of Technology, Chicago, 1949. 154 pp., illus., 9 x 6 in., paper, $3.00.

The complete text of all papers presented at the Fourth Meeting of the Conference, October 20-21, 1948, is included here. The papers are on the automotive torque converter, hydraulic circuits on farm equipment, flanged joints, gaskets, packings and seals, hydraulic turbine developments, hydraulic surges, jet pumps performance, the J.I.C. hydraulic standards for industrial equipment, application of hydraulic servomechanisms, and the measurement of servomechanism performance.

PROCEEDINGS OF THE 1948 ANNUAL MEETING OF THE ENGINEERING COLLEGE RESEARCH COUNCIL OF THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION:

Engineering College Research Council, Iowa City, Iowa, 1949. 76 pp., 9 x 6 in., paper, $1.00.

The papers presented at this annual meeting deal with problems of research in various engineering fields, and with surveys of the accomplishments of research.

SNOW AND ICE CONTROL IN CITIES OVER 200,000 POPULATION:

American Public Works Association, Chicago, 1949. 17 pp., illus., 11 x 8½ in., paper, $1.00. (Public Works Engineer's Special Report No.6).

This comprehensive report deals with costs, equipment, organization and other details of U.S. and Canadian big city snow problems. Of interest to those concerned with snow and ice control in communities of all sizes.

SURFACE DRAINAGE OF HIGHWAYS:

U.S. Highway Research Board, Washington, 1948. 29 pp., illus., 9¾ x 7 in., paper, 45c. (U.S. Highway Research Board, Research Report 6-B).

The contents include a report of the Committee on Surface Drainage, of Highways, and three papers: description of apparatus and procedure for testing flow in gutters and storm drain inlets; theory of flow through short tubes with smooth and corrugated surfaces and with square edged entrances; and experiments on flow through inlet gratings for street gutters.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

CYLINDER WEAR IN DIESEL ENGINES:

C. Hoegh. Chemical Publishing Co., Brooklyn, New York, 1949. 191 pp., plus Addendum, 52 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $5.00.

Of interest to all those concerned with Diesel engines, this book gives a critical analysis of the factors which influence the wear in Diesel engine cylinders. Special attention is paid to large marine installations. Such factors as lubrication, fuel oils, deposits and abrasives, corrosion, and operating conditions are among those treated. References to selected literature are included, as are the results of investigations made by the author.

ELECTRIC AND MAGNETIC FIELDS:

S. S. Attwood, 3rd ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 475 pp., diagrs., charts., tables, 9¼ x 6 in., cloth, $5.50.

This book provides a smooth transition from the study of mathematics, mechanics and physics to advanced electrical engineering. In this edition, the material on the magnetostatic field is rewritten to emphasize current rather than magnetic poles as the source of the magnetic effect. The sections on magnetic materials have been improved, and an elementary discussion added on dia-, para-, and ferro-magnetism. In line with recent trends, the formulas throughout the book have been recast in the rationalized form of the MKS system.

ELECTRICAL TRANSMISSION OF POWER AND SIGNALS.

E. W. Kimbark. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 461 pp., diagrs., charts, tables 9¼ x 6 in., cloth, $6.00.

Of value as a reference book to the professional engineer and as a text in electrical transmission courses, this book presents the basic theory of transmission lines together with applications to all three fields of power, telephony, and ultrahigh frequencies. The theory is given in three main parts: transmission-line parameters, steady-state phenomena, and transient phenomena. Charts, tables, and graphs of the characteristics of various types of conducting lines are included.

ELECTRIC-LAMP INDUSTRY: Technological Change and Economic Development from 1800 to 1947.

A. A. Bright, Jr. Macmillan Company, New York, Toronto, 1949. 526 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $7.50.

Focused upon the technological progress of the lamp industry, this book considers the factors which influenced the direction, extent and timing of the advances in industry in the last 150 years. It discusses the influence of cartels, tariffs, and anti-trust legislation on the process of innovation, along with the effect of the patent system. This is the second of a series of five studies of the economics of science and engineering.

ENGINEERING WITH RUBBER:

Edited by W. E. Burton. McGraw-Hill Book Co., New York, Toronto, London, 1949. 486 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.80 (in Canada).

Based on information from technical catalogs and bulletins, this book gives a comprehensive picture of the engineering, design, and maintenance principles which must be considered in using rubber in industry. The physical and chemical properties of various rubber compounds and the typical dimensions and structural details of industrial rubber products are discussed in detail. Many illustrations and tables are included.

HEATING VENTILATING AIR CONDITIONING GUIDE, Volume 27, 1949:

American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York. 1384 pp., illus., diagrs., charts, tables, 9¼ x 6¼ in., cloth, $7.50.

This standard manual constitutes both a textbook and handbook on the design and specification of heating, ventilating, and air conditioning systems. The technical data section is enlarged by some eighty pages owing to revisions and additions in accordance with current practice. The catalog data section has been increased by the addition of up-to-date products of many additional manufacturers.

PHOTOELECTRICITY AND ITS APPLICATION:

V. K. Zworykin and E. G. Ramberg. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 494 pp., illus., *diagrs., charts, tables, 9¼ x 5 in., cloth, $7.50.*

Replacing the second edition of "Photocells and Their Application", this book presents up-to-date data on the properties, preparation and application of photoelectric devices. The emphasis is on the practical aspects of the subject. Following a historical introduction, the principles and preparation of photoelectric devices are discussed. The remaining chapters provide detailed consideration of a variety of applications. The last chapter discusses the range available for future developments. Numerous references are given at the end of each chapter.

PLANT PRODUCTION CONTROL:

C. A. Koepke. 2nd ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 568 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.50.

A broad background is presented of the problems of production planning and control as they apply to a variety of industrial situations. In this second edition, there is a greatly expanded coverage of the position of the planning and control function and the mechanism of operational detail. New practical examples, forms, and problems along with theoretical discussions are included, and there is a fresh approach to the problem of economic purchase and manufacturing quantities.

ROUTE SURVEYING:

G. W. Pickels and C. C. Wiley. 3rd ed. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 434 pp., illus., diagrs., charts, tables, 7 x 4½ in., cloth, $4.75.

Beginning with a general discussion of survey work, the author proceeds to detailed explanations of maps, plans, profiles, distance considerations, grades and curves. Separate chapters are devoted to the various types of curves and spirals, their calculation and layout, both for horizontal and vertical situations. Earthwork problems are dealt with at considerable length. In general, railroad surveys are treated first and in detail, with suggestions as to the application or modification of such methods to highways, canals, pipe lines, etc. The new edition has been considerably revised, particularly the chapter on string-lining.

STREAMLINE FLOW:

H. F. P. Purday. Constable & Company Ltd., 10 Orange Street, London, W.C.2, 1949, 185 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, 18s.

This book is an introduction to three closely related parts of physics: mechanics of non-turbulent flow; the flow of heat by conduction; and heat transfer between solids and fluids in states of non-turbulent flow. There is a threefold emphasis on physics, mathematics, and technical applications. Only an elementary knowledge of the calculus is assumed. A short bibliography is included.

THERMODYNAMIC CHARTS FOR COMBUSTION PROCESSES:

Part I. Text, 75 pp., diagrs., charts, tables, $2.60.
Part II. Charts, $2.40.
N. C. Hottel, G. C. Williams and C. N. Satterfield. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 11¼ x 8½ in., paper.

Part II contains a large modified-air chart, seven large burned-mixtured charts, and two groups of tables: of equilibrium gas compositions for various combinations of ratios of C, H, O and N; and of dimensionless functions of enthalpy, entropy, etc. Part I contains the descriptive and explanatory text containing smaller generalized thermodynamic charts and illustrative calculations. Examples of combustion power cycles to which these date apply are given, including the Diesel cycle, Otto cycle, ram jet, turbocompressor, and rocket.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

BUILDERS' MATERIALS.

B. H. Knight and R. G. Knight. Longmans, Green & Co., New York; Edward Arnold & Co., London, 1948. 2nd ed., 304 pp., diagrs., tables, 8½ x 5½ in., cloth, $5.25.

Of interest to architects, surveyors and builders, this British book explains the physical nature, method of manufacture, uses and defects of building materials in common use. Wherever possible, simple explanations of test methods are given. This edition includes references to the more important British Standard Specifications published between 1938 and 1946, and the more important results of relevant research work published during that period.

CHAMBER'S SIX-FIGURE MATHEMATICAL TABLES, 2 Vols.

Vol. I. Logarithmic Values.
Vol. II. Natural Values.

L. J. Comrie. D. Van Nostrand Co., Toronto, New York, London, 1949. 576 pp., each, tables, 10¼ x 7 in., cloth, $10.00 each ($17.50 per set).

Vol. I of this set provides tables of logarithmic values as follows: of numbers up to 100,000 in various ranges and intervals; of trigonometrical functions of angles in degrees, minutes and seconds; of angle functions in degrees and decimals and in radians; of hyperbolic and gamma functions. Vol. II provides tables of natural values for: trigonometrical functions of angles in degrees, minutes and seconds; angle functions in degrees and decimals; circular functions (argument in radians); exponential and hyperbolic functions; also natural logarithms, powers, roots, reciprocals, factors, prime numbers, etc. Explanatory notes, conversion tables, physical and mathematical constants, and bibliographies of more extended tables appear in both volumes.

MUNICIPAL ENGINEER.

L. B. Escritt. Macmillan Co., New York; George Allen & Unwin Ltd., London, 1949. 252 pp., diagrs., maps, tables, 7½ x 4¾ in., cloth, $2.00.

Intended for those now in or desiring to enter a municipal engineering department, this book, written from the British point of view, describes in detail the working of the department. It outlines the scientific processes involved in road construction, water supply and sewerage, and discusses the relations of these environmental services to town planning.

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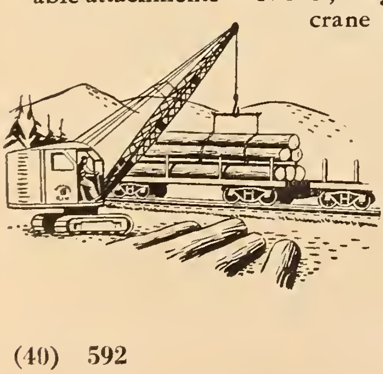

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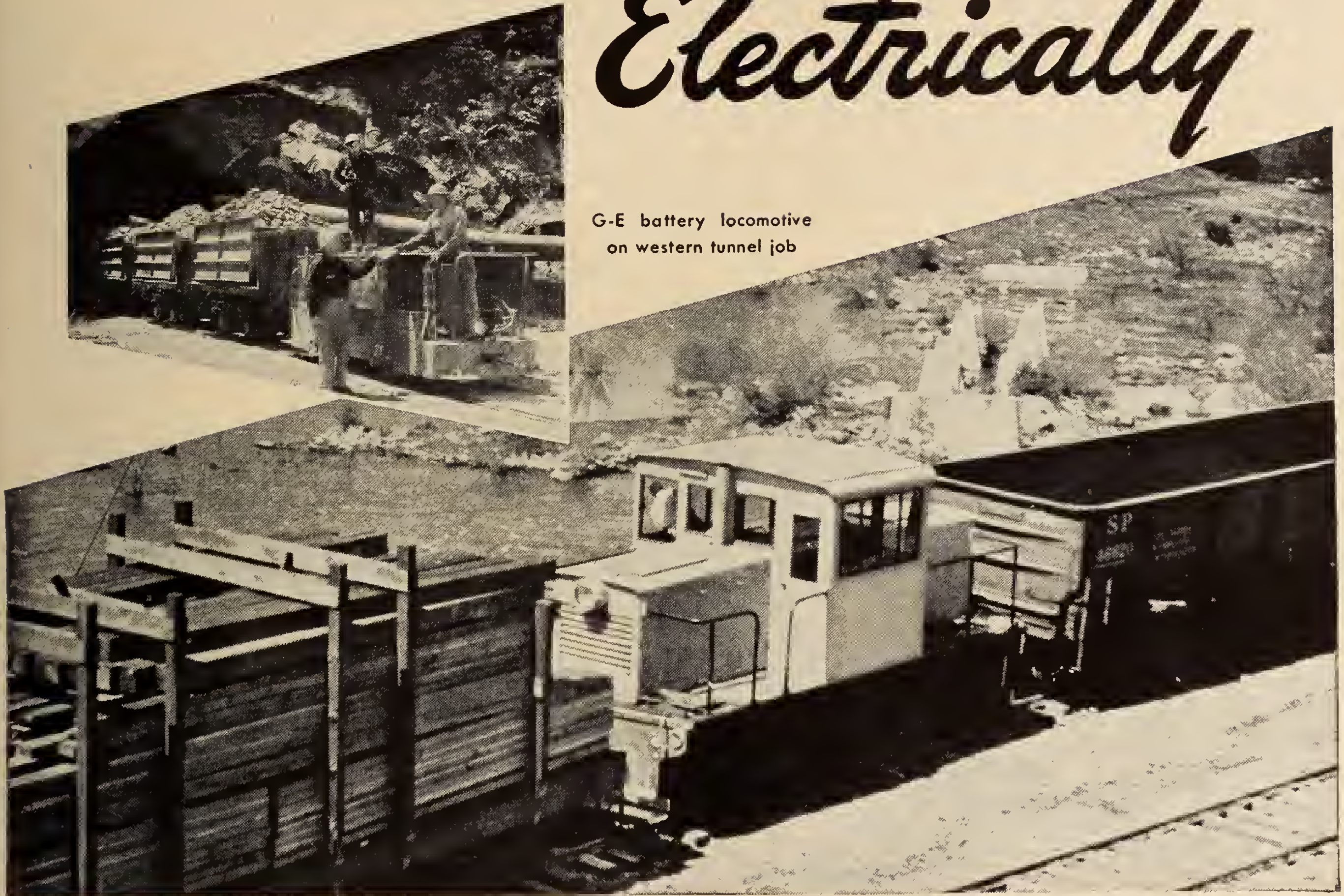

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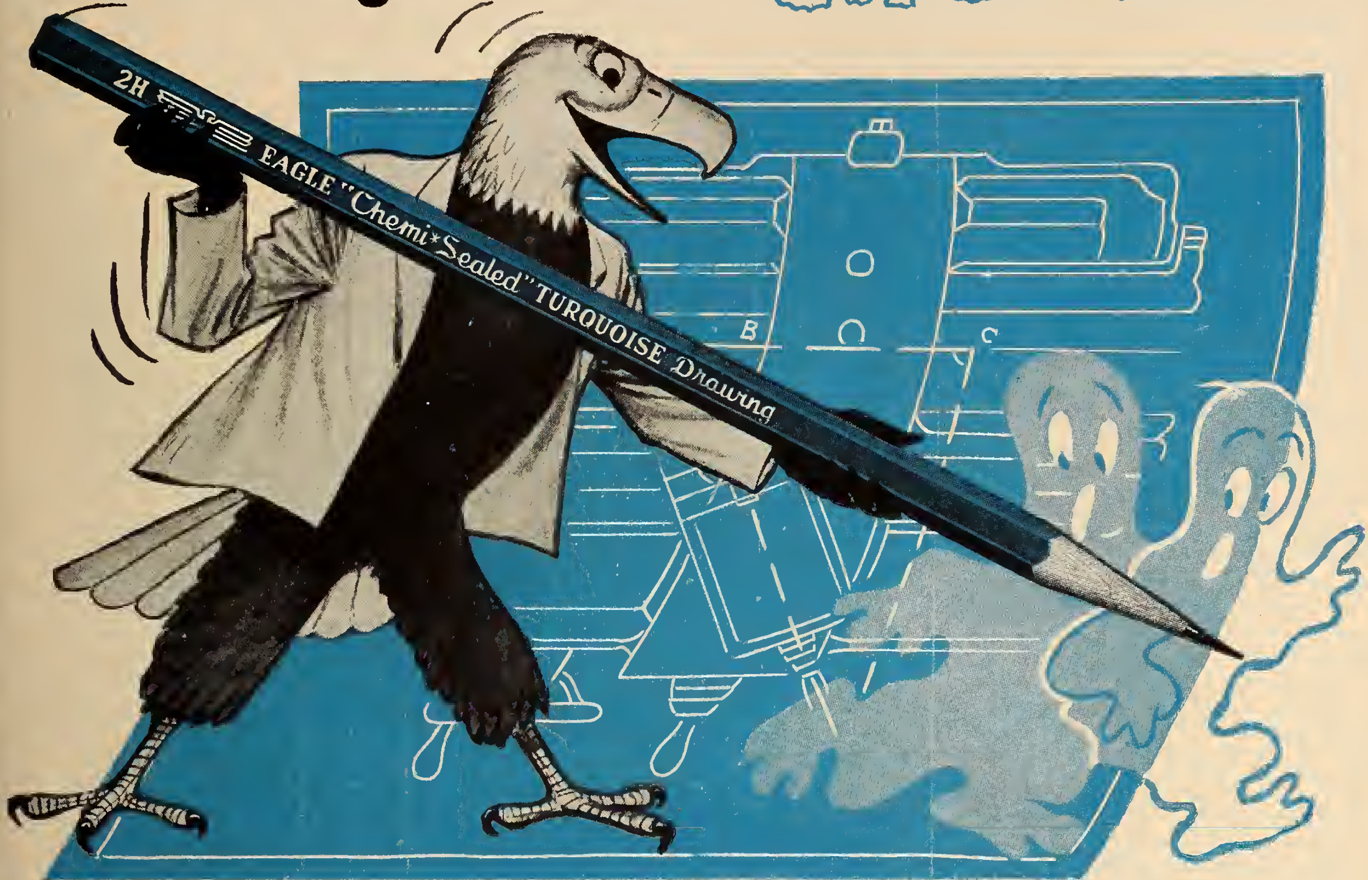

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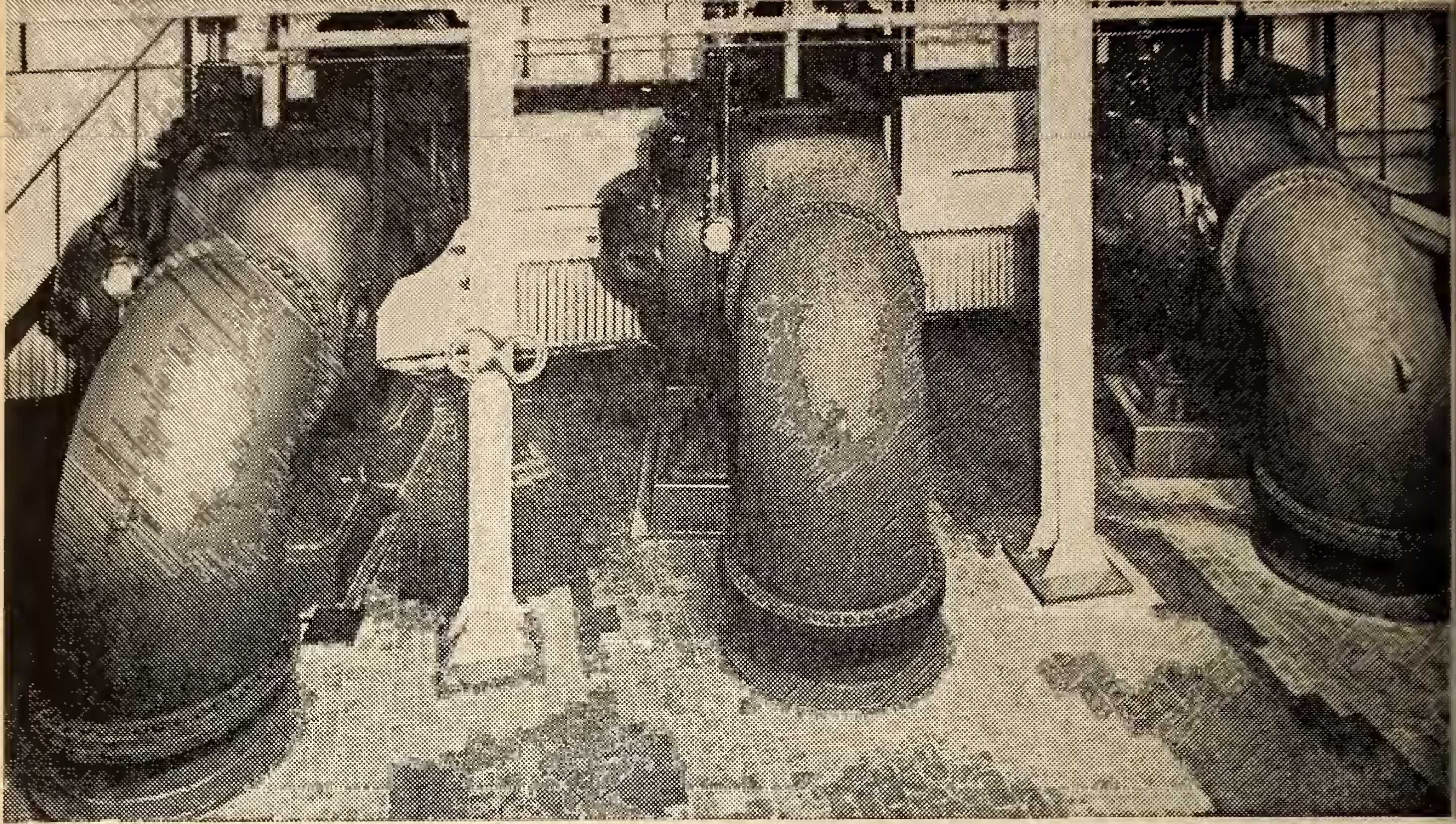

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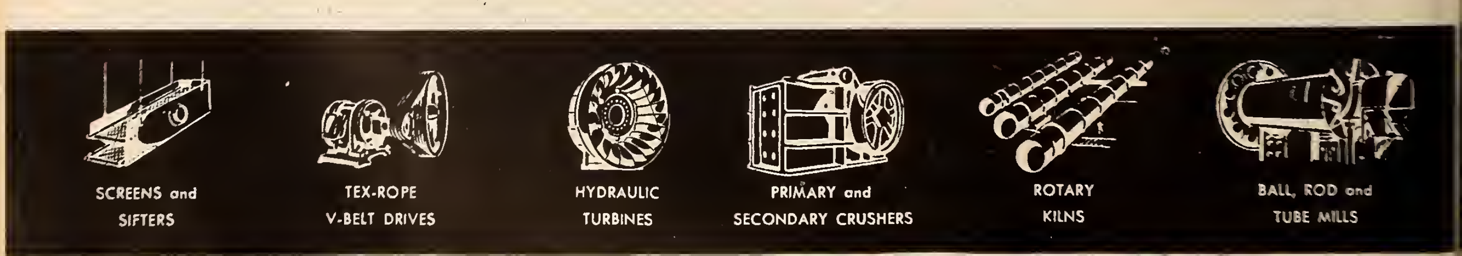

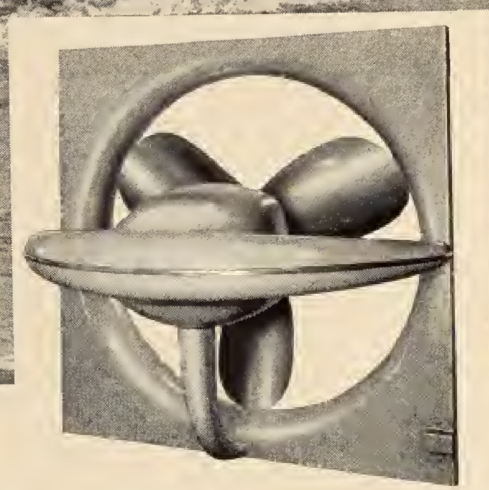

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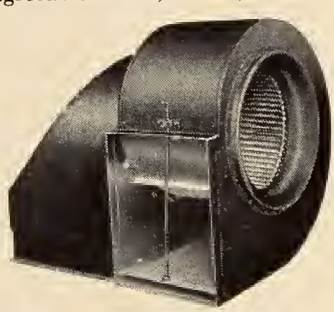

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Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

The Minister of Labour stated recently that more than 93 per cent of the largest university graduating class in Canadian history was placed in employment by the middle of July. The Minister pointed out that 50 per cent of the graduates were veterans of World War II.

•

Government spokesmen stated in Ottawa on August 10, that work on the $400,000,000 Trans-Canada highway will probably start next spring. Legislation to provide financial assistance to the provinces is expected to be introduced by the Government in the forthcoming session of parliament. This aid is likely to total between $150,000,000 and $200,000,000.

Government spokesmen said that the highway would take from three to seven years to build and, while not intended to be an unemployment relief measure, it would take up any slack in any province where there might be unemployment. The report indicates that the highway will not be a "super highway" but "one road" with a hard surface good for all weather. Highway ministers of all provinces met in Ottawa last December and agreed on a broad policy for the road's construction.

•

Interprovincial Pipe Line Co., a subsidiary of Imperial Oil Co., has applied to the Board of Transport Commissioners for authority to construct a 16-inch oil pipeline from Regina to the Gretna, Man., region.

•

It is announced that the Bawden Company, manufacturers of fire hydrants, pumping and other municipal and industrial equipment, has purchased the manufacturing and sales rights of the Kerr Engine Co. Ltd. of Windsor, Ontario. The Kerr Company manufactured fire hydrants, valves, etc., for a period of seventy-seven years. All designs, patterns, jigs, and fixtures, finished stock, and some of the production machines have been moved to the Bawden plant in Toronto.

•

Britain's industrial production is 30 per cent above the prewar level and it has risen 8 per cent during the past five months.

Leading authorities in the field of science and engineering, provincial ministers, and deputy ministers attended the sixth annual conference of Provincial ministers of mines, held in Fredericton, N.B., Sept. 7-10.

•

The Consolidated Mining and Smelting Co. of Canada Ltd., has announced commencement of operation of a new slag fuming furnace unit. Built at a cost of about one million dollars the new unit is the second of its type to be installed in the Company's lead smelter. It will handle lead blast furnace slag at the rate of about 500 tons a day. The charge will contain about 17 per cent zinc and 3 per cent lead, these metal values being recovered first in the form of lead-zinc oxide dust and finally as refined metal after subsequent treatment in the zinc department, lead smelter, and refinery.

•

Tenders have been invited by the National Research Council for the construction of ten additional houses at Deep River to provide further needed accommodation for the families of scientists working at the Atomic Energy Project. The village now has approximately four hundred family dwellings and accommodation for about four hundred single persons in the staff hotel. The new houses will be of square plan, two storeys in height and each will have seven rooms and bath. The population of the village is about 1,800 of which approximately 550 are children.

•

A new and improved a-c load visualizer, combining 5 instruments in one, is available from Canadian General Electric's meter and instrument section. Besides serving as a standard 0-2.5/5/25/50-amp ammeter and a 0-150/300/600-volt voltmeter, the new device can be used with a split-core or conventional instrument transformer to extend the range for determining watts, vars, volt-amperes, and power factor. Designated as the type AF-2, the new instrument can be applied in load surveys, induction motor tests, reactive power studies, and power factor checks in power and lighting circuits. Complete details may be obtained from the Company.

•

Officials of the mines division of The Consolidated Mining and Smelting Company of Canada Ltd., report that results of preliminary diamond drilling on the 2300 foot level of the Campbell Shear at their Yellowknife operations indicate the possibility of a new large ore body in the vicinity of the Con-Rycon boundary line. Average ore grade from drill results so far is considerably lower than the mine average but the deposit may prove of such size as to be economically workable.

•

Since the war, Canada's trade commissioner service has steadily expanded. Today there are 90 senior officers and assistants working abroad from offices located in some 40 countries. This expansion has permitted a more intensive examination of some of the smaller and lesser-known markets.

•

Although construction of the pipe line from Edmonton to Regina, Sask., is not expected to be completed until late next year, Alberta Government officials already are looking far beyond the limit of the pipe line for the province's expanding oil production.

Mines and forests minister N. E. Tanner has suggested an exchange of oil markets between Canada and the United States, and Federal mines and resources minister Colin Gibson has stated that this could possibly be the answer to the market problem. Mr. Tanner has suggested that oil could be piped to the United States via Duluth, Minn., serving such areas as the Chicago market. American producers would continue to supply the large eastern Canadian market. The minister said that this would save Canadian producers the extra cost of moving directly into the eastern Canadian market.

The Hon. Mr. Tanner has predicted that Alberta's proven oil reserves will develop to 5,000,000,000 barrels in the next five or six years, provided current exploration and developments are successful. This will provide a daily production potential of 500,000 barrels or 100,000 more than Canada's requirements. According to information released by the Alberta government, the present oil reserve in Alberta amounts to 1,000,000,000 barrels giving a daily potential of 80,000 barrels. However, voluntary prorating, forced by the restricted market, is keeping production down to some 55,000 barrels, sufficient to supply the Prairie market only.

•

At a meeting of the Community Planning Association of Canada held in Ottawa on August 23rd, it was stated


YOU SEE THIS ONLY ONCE
THE all-important steel frame of a modern building is only seen during construction—yet the safety and durability of the structure depends largely on this vital steel work.
Dominion Bridge has designed, fabricated and erected the steel frames of most of Canada's largest buildings.
Illustrated: The Marine Building, Vancouver. Building steel work by Dominion Bridge.
STRUCTURAL DIVISION
DOMINION BRIDGE
COMPANY LIMITED
Established 1882
PLANTS and OFFICES in PRINCIPAL CITIES OF CANADA — HEAD OFFICE: LACHINE (MONTREAL) QUEBEC

that there is widespread conflict in the building policies of various Federal Government agencies and between these agencies and provincial and municipal governments.

The Association recommended to the Royal Commission on Arts and Science Development the establishment of a Federal Government clearing house to consolidate all national building policies and to co-ordinate these policies with those of the provincial and municipal governments.

To develop and expand community planning, the Association made the following recommendations:

1. Construction of a greater number of community halls through Federal Government subsidy. These could serve as meeting places for community planners.
2. Better planning of national housing and other building projects through a policy clearing house which could be located in the Reconstruction Department's public projects branch.
3. Central Mortgage and Housing Corporation awards for skilfully executed private projects.
4. Elimination of Federal Government tax on donations to the planning association and to other such organizations in the arts, science and letters field.
5. Greater freedom of film, radio, and television productions dealing with Canada's resources from dependence on either commercialism or narrow governmental goals.
6. Expansion of Government aid to research and teaching of community planning.

On August 22nd, it was reported that General Motors Diesel Ltd., moved to complete the purchase of a 210-acre factory site east of London, Ont. The organizational meeting of the Company was devoted to the election of directors. At a directors' meeting which followed Company officers were elected and action to obtain possession of the plant site was approved. Officers of the company are: E. F. Rippingille, Jr., president and general manager, A. F. Power, vice-president; M. L. Prentis, treasurer, W. M. Collins, secretary, J. H. Organ, assistant comptroller.

•

Construction and improvement projects providing 34,000 man-days of work have been approved by the board of directors of the Canadian Johns-Manville Co. Ltd.

The projects had been planned for a later date, but the directors' decision to get the work underway ahead of schedule was made to increase employment to the highest possible figure during the coming winter months.

The projects include construction of new concrete roads to new underground mines, repairing and resurfacing roads in the Asbestos mills area, additional fencing around open pit mines, extension of bagging floors in the mills, additions to the dust shed, and extension of a dust collecting system.

•

From its initial well in the Leduc field, commenced in February, 1947, Imperial Oil Ltd. has expanded its production in the Edmonton area to a daily average of around 21,000 barrels in June, 1949. A total of seven million barrels was produced to the end of June when Imperial's wells totalled 230.

The photograph above shows the new general assembly shop of the Dominion Bridge Co. Ltd. at Lachine, Que. The shop has a floor area of some 55,000 square feet. Work currently in progress is largely for Ontario Hydro's multi-million dollar power developments and includes control gates, bedded parts, scroll cases, and penstock sections.

Chain Belt Company of Milwaukee has announced that Self-Priming Rex Speed Prime Pumps are now being built for electric motor drives with two new mountings. The following advantages are claimed — ability to take any speed of proper horse power electric motor, compact, Self-Priming, Rex Z-Metal Peeler and impeller, rotary grease seal, press formed steel pump body and volute.

•

Mr. John Freeman, M.B.E., M.P., joint parliamentary secretary to the United Kingdom Ministry of Supply, arrived in Toronto by air via New York on Thursday, August 25th. He opened the British Commonwealth Section at the Canadian National Exhibition. Mr. Freeman also visited Ottawa, Shawinigan Falls, Arvida, and Montreal. He returned to the United Kingdom on September 7th.

•

In 1948 the Town of Cobourg, Ontario, constructed a 15-inch diameter sewer to serve a new industry. It was necessary to pass under seven yard and two main line tracks of the C.N.R. and the main line of the C.P.R. at a depth of about 17 feet.

To overcome this problem the specialized services and experience of Armco Drainage & Metal Products of Canada Limited were engaged. A total of 195 lineal feet of 48-inch diameter Armco Tunnel Liner Plate was installed without interrupting traffic. Consulting Engineers on the project were Proctor, Redfern, and Laughlin. C. B. Saunders, Town Engineer, represented the municipality and H. J. McFarlane Construction Company were the general contractors.

•

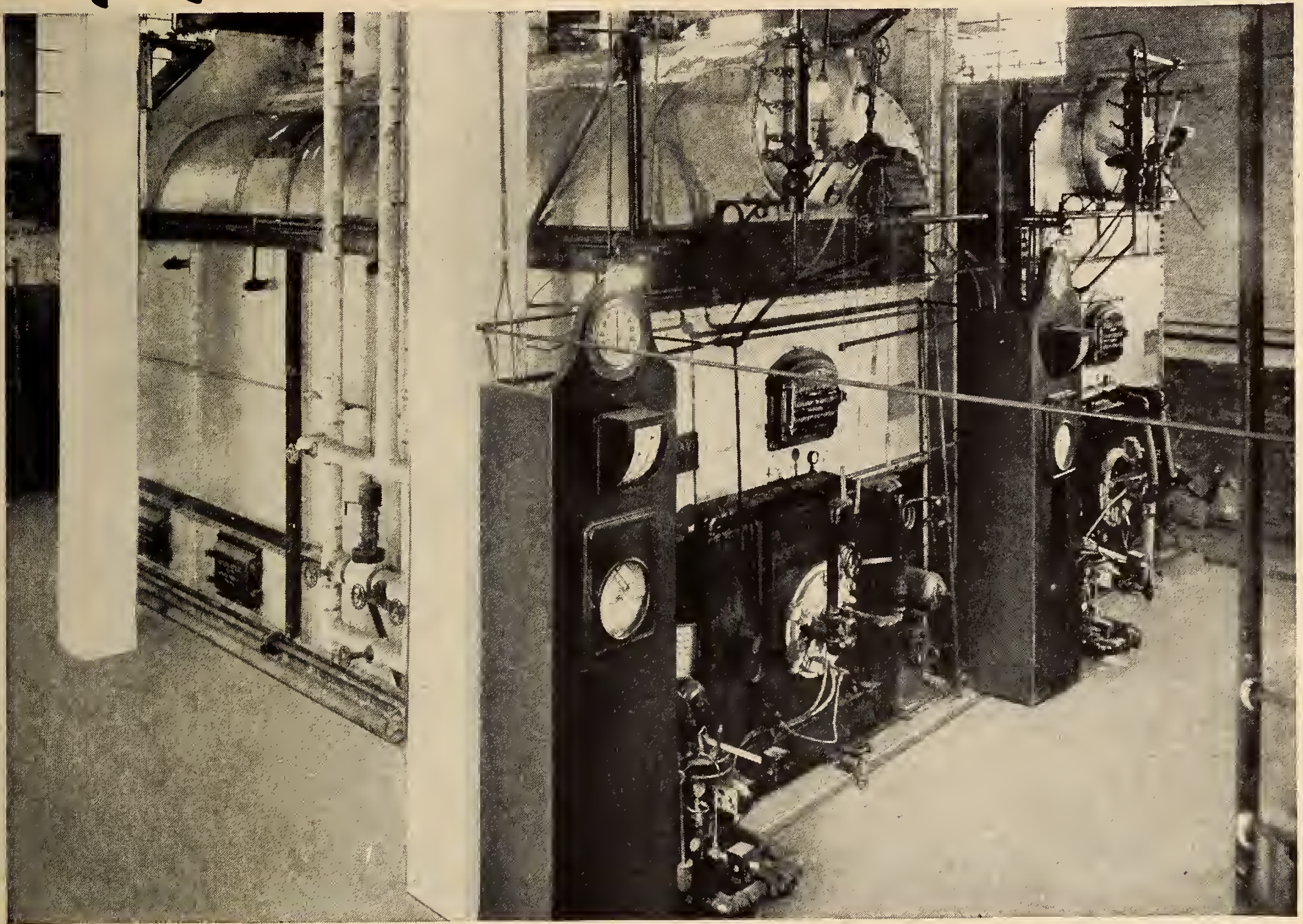
At scientific research stations at Churchill, Man., and Baker Lake, N.W.T., some of the most competent Canadian specialists are conducting basic research programmes in entomology, the mechanics of snow and ice, nutrition, archaeology, protection against cold, and many related subjects. Weather stations have been established at strategic locations throughout the North and as a result, meteorological knowledge is rapidly expanding. Scientists from the Dominion Observatory are working in the fields of geophysics and terrestrial magnetism. Geologists, topographers, and geographers are also at work in the north.

•

J. G. Morrow, chairman of the Canadian Standards Association, made the following statement on August 25th:

" Since last Fall more than two hundred new members have demonstrated their interest in the development and establishing of national standards by giving their financial support to the work of the Canadian Standards Association. This increased interest on the part of industrial organizations is very significant, because industral technology, in developing and improving Canada's tremendous productive facilities, is not doing all its job unless it makes progress also in introducing standards into the necessarily complex pattern of modern life.

Through the creation of voluntary standards on the part of industry, the works of technicians have been reproduced in such great quantities as to raise the economic level on the North American continent head and shoulders above the rest of the world. Therefore, it is essential that all who support our system of individual responsibility and enterprise, take active part in the volun-



tary standards movement—because the alternative is standardization which may be compulsory.

•

The following information was received from the United Kingdom Information Office, Ottawa, Canada.

The sharp increase in Britain's gold and dollar deficit in the second quarter of 1949, revealed by Sir Stafford Cripps on July 6th, will be seriously misunderstood if it is thought of as due *solely* to Britain's trade deficit with the United States. Since the gold and dollar reserves held in London are used by *all* sterling countries, and since dollars are spent by all these countries in the whole dollar area—and outside it too—"Britain's" dollar deficit is really the dollar deficit (on visible and invisible items) of all the Sterling Area with all the Dollar Area, and with third countries. This shows immediately that a remedy for Britain's dollar deficit cannot be found by considering the U.S.-U.K. and Canada-U.K. trade relationships alone, important though these are. A solution must take into account:

(a) U.K. imports from and exports to all the Dollar Area;
(b) Other Sterling countries' imports from and exports to all the Dollar Area;
(c) All Sterling Area dollar payments to non-dollar countries;
(d) All Sterling Area dollar earnings and losses on "invisible" items.

Definitions: The Sterling Area consists of the United Kingdom and all British Commonwealth countries (except Canada), Eire, Burma, Iraq and Iceland.

The Dollar Area consists of the U.S. dollar account countries (U.S., Philippines, Cuba, Mexico, Colombia, Ecuador, Bolivia, Venezuela and Central American countries), plus Canada.

Appointments and Transfers

Canadian Vickers Limited announces that G. Agar has been appointed executive engineer and assistant general manager; R. K. Thoman has been appointed assistant general manager, engineering division; and R. Lowery has been appointed naval architect and assistant general manager.

•

The Northern Electric Co. Ltd. has announced the appointment of C. E. Woolgar as wire and cable manager of the general sales division and M. R. Macdonald as sales superintendent of the wire and cable division.

•

L. A. Lambe, of the mechanical goods division of Dominion Rubber Co. Ltd., has been transferred to the Northwestern Quebec and Kirkland Lake-Timmins area where he will assist A. A. Reid, the Company's representative in that territory.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

A new eight page catalogue describing "Rigidsteel" design for building construction may be obtained from McCloskey Company of Pittsburgh, 3400 Liberty Avenue, Pittsburgh 1, Pa. Special applications for industrial, municipal or commercial buildings — either conventional or eccentric in design are discussed in full. Ask for "The McCloskey Story".

•

Crane Steelware Limited, Industrial Centre No. 5, Quebec City, Que. and Alliance Ware Ltd., Vancouver, B.C. offer catalogue ADM-9010, in which is described a new line of Canadian made porcelain—on—steel products. The principal products considered are bathtubs, sinks and other sanitary and plumbing accessories.

•

"Curtisstrip" a large capacity wireway and raceway, designed to facilitate the installation of all types of lighting equipment, both fluorescent and incandescent, is described in an eight page illustrated folder just released by the Curtis Lighting Co. of Canada Ltd. The address is Curtis Lighting Co. of Canada Ltd., Leaside, Toronto 17.

•

The Automatic Clutch Corporation of Canada, 165 Spadina Avenue, Toronto offers a twelve-page, two-colour folder dealing with the BLM Automatic Clutch. Enclosed in the folder is a large size "Pin-up" sheet of decimal equivalents.

•

Dennis Chemical Company, 2701 Papin Street, St. Louis 3, Mo., has published a four-page folder entitled "Perma-Skin Vinyl Corrosion Resistant Protective Coatings". Copies are available.

•

Canadian General Electric Company Ltd., 212 King Street, West Toronto 1, offers a four-page pamphlet entitled "How Electricity is Generated from Water-power". The pamphlet will be of value as a handy reference on the output of central power stations. It contains a chart the motif of which is "a simplified description of a typical station with some indication of the massive and intricate equipment employed". Ask for publication No. 4089-Q.

•

Pittsburgh Corning Corporation, 307 Fourth Avenue, Pittsburgh, Pa., offers a 12-page brochure "PC Foamglass for Home Insulation".

•

The new all-purpose Model 363 Portable Belt Conveyors manufactured by the Barber-Greene Company, Aurora, Ill., are the subject of a new eight-page bulletin just released by the Company. Ask for bulletin No. 363.

•

The International Rectifier Corporation, 6809 South Victoria Avenue, Los Angeles 43, California, offers copies of its new publication "Rectifier News". This publication will feature technical articles, photographs, circuit diagrams concerning new developments in the field of dry-plate rectifiers for converting a-c to d-c current.

•

Caterpillar Tractor Co., Peoria 8, Ill., offers a new booklet dealing with the

Company's Diesel DW10 Wheel-Type Tractor. The Company also offers a sixteen-page publication entitled "Users Know 'Caterpillar' Diesel Engines".

•

The Coles crane, a British product, is now being distributed in Canada by Steel Engineering Products, Limited, 1101 Millwood Road, Leaside, Toronto. In 1922 the Coles Company built what they believe to be the world's first truck-mounted crane. The new Coles crane has a cantilever type of boom with a full 360 degree swing. This mobile crane has four motions: hoist, boom hoist, swing, and travel, each operated by a separate motor; but all four are run by a three-in-one controller mounted immediately in front of the steering column. Complete literature describing Coles cranes may be obtained from the Canadian distributor.

•

Hardinge Company Incorporated, 240 Arch Street, York, Pennsylvania, have issued a bulletin on Ruggles-Coles rotary dryers, kilns, and coolers. The bulletin is well produced and highly informative. It measures 8½ by 11 in. and contains 32 pages. Ask for Bulletin No. 16-D.

•

Crane Limited, 1170 Beaver Hall Square, Montreal, have recently introduced a line of diaphragm valves utilizing a new design principle that limits the diaphragm function to sealing the bonnet only. A separate seating member, giving positive control of flow independently of the diaphragm, reduces the flexing to which the diaphragm is subjected and completely eliminates the diaphragm crushing action that is inherent in designs where the diaphragm itself is used to effect valve closure. Two types of valves are available, one plain iron and the other neoprene lined and coated. A well-produced circular describing these valves is available. Write to the Company at the address given above and ask for Bulletin AD 1761.

•

LaSalle Builders Supply Limited, 159 Jean Talon St. West, Montreal, have available folders and brochures describing the application and uses of "Ciment Fondu", a British-made aluminous cement for which they are the Canadian distributors. Ask for literature on "Ciment Fondu".

•

The "Welding Review", published by the Canadian Liquid Air Company Limited, is now in its twenty-fourth volume. The "Review" is recognized as one of the leading Canadian publications dealing with welding. The publisher will be pleased to place Institute members on the mailing list. Write to Canadian Liquid Air Company Limited, 1111 Beaver Hall Hill, Montreal, P.Q.

•

The May, 1949 issue of "The Dominion Engineer" contains an article describing Powell River Company's No. 8 Machine. This issue is recommended particularly to engineers interested in pulp and paper machinery. For copies write to the Dominion Engineering Company Limited, P.O. Box 220, Montreal 2, P.Q.

•

Aircraft-Marine Products Inc., 1523 N. Fourth Street, Harrisburg, Pa., have produced a pocket-sized catalogue on "Solderless Wiring". The catalogue has been produced in such a manner that the user may determine at a glance the type of wiring the manufacturer recommends for various jobs. The emphasis is placed on "Precision engineering applied to the end of a wire."

•

B.C. Coast Woods Trade Extension Bureau, 837 West Hastings Street, Vancouver, B.C., has issued two new booklets—"Use Pacific Coast Hemlock" and "Use Western Red Cedar". These booklets are designed as consumer sales pieces "to acquaint the home building public with the many possible applications of these important Coast species". Copies may be obtained on application to the Bureau.

•

An outline of the physical background and economic development of Newfoundland has been prepared by the geographical bureau of the Department of Mines and Resources, Ottawa. This handbook is one of a series of information bulletins published by the Bureau on various aspects of the geography of Canada. Copies may be obtained on request.

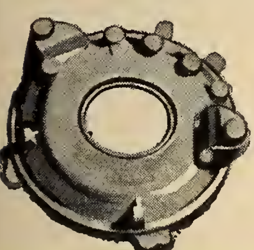
•

A compact, detailed handbook on troughing and return idlers is presented by Lippmann Engineering Works, 4603 W. Mitchell St., Milwaukee, in their new twelve-page two-colour Bulletin No. 1410.

Most Engineers are from Missouri

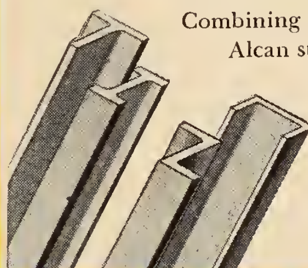
They don't take things for granted.
They have to be sure of the materials they specify.
Today more and more of them are sold on aluminum —
on its lightness, durability and fine appearance. They're specifying this
bright, rustproof metal for an ever-widening variety of engineering requirements.
Shown below are four of the many Alcan aluminum products of interest to engineers:

Alcan Aluminum Castings



Clean, smooth castings with unusually fine grain and close tolerances. These rustproof, corrosion-resistant castings need no painting. They weigh approximately 50% less than similar castings made of other metals.

Alcan Aluminum Structural Shapes

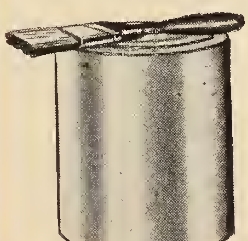


Combining high-strength with light weight Alcan structural shapes are the answer to many engineering problems. Available in a wide variety of shapes and sizes. Standard shapes are described in detail on data sheets available on request.

Aluminum Foil Insulation

Reflects 95% radiant heat. An ideal insulation for boilers and steam piping. Helically-wound aluminum foil-air heat insulation is fireproof and permanent. It will not absorb water in the event of leakage.

Aluminum Paint Made with Alpaste

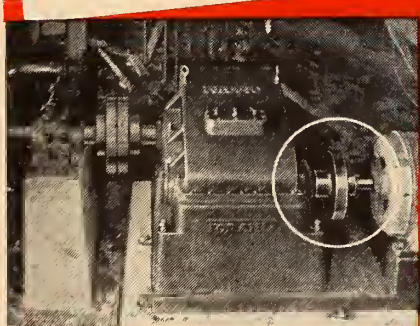


Reflects 75% of light and radiant heat — reduces temperature rise in tanks and building interiors. holds heat inside boilers and pipes. Aluminum Paint made with Alpaste has high opacity. Its reflective quality brightens plant interiors, cuts lighting costs.

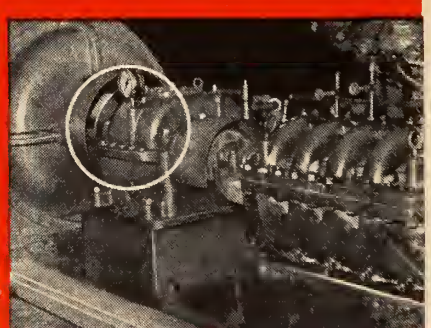
ALUMINUM COMPANY OF CANADA, LTD.

Producers and Processors of Aluminum for Canadian Industry and World Markets

MONTREAL • QUEBEC • TORONTO • VANCOUVER • WINDSOR



BLM Automatic Clutch in drive from 150 HP electric motor to Forano speed reducer in drive to conveyors in pulp mills. Complete unit supplied by Forano Limited, Montreal.



BLM Automatic Clutch in drive to speed increaser to centrifugal pump. Supplied by Northern Foundry and Machine Co. in pump installation at International Nickel Co. mines.

The International Rectifier Corporation, 6809 So. Victoria Avenue, Los Angeles 43, California, recently released a bulletin identified as PC-649, describing its new line of selenium self-generating photo-electric cells. This bulletin will be supplied without charge.

•

The Canadian Blower & Forge Co. Ltd., Kitchener, Ontario, recently published bulletin 502-C which describes "Buffalo" Air Conditioning Cabinets. This bulletin is well written and profusely illustrated. It contains physical data describing the various cabinets manufactured by the Company and it is produced in such a way that ring-binding is facilitated. The bulletin measures 8½ by 11 in. Copies will be sent to "*Journal*" readers on request.

•

Caterpillar Tractor Company, Peoria, Illinois, is noted for the high grade of the literature it publishes describing "Caterpillar" Equipment. Two new bulletins are offered—"Slope Stake to Final Grade with Caterpillar Equipment" and "'Cat' Motor Graders—Tools of Public Service."

•

With the publication of its application engineering data on the "Parshall Flume and Weir Flow Recording Controller", The Foxboro Company, Foxboro, Mass., begins a series of service publications for public utility men, contractors, and engineers. As indicated by their name, and distinguished from the Company's sales bulletins, the sets of application engineering data are intended as practical tools for use in planning and estimating and in preparing specifications. The data set mentioned above contains dimensional diagrams for different types of flumes and weirs, tables of flow values, etc. Address requests for copies to Foxboro's Canadian representatives, Peacock Bros. Limited, Ville La Salle, Montreal, P.Q.

•

The Canadian Liquid Air Company Limited are Canadian distributors for a new device to assist persons engaged in under-water work.

The apparatus consists of a portable cylinder of compressed air for strapping to a swimmer's back and connected by flexible rubber tubing to a special breathing valve operating on the "Cousteau-Gagnan" system. The swimmer breathes through a rubber mouthpiece and wears a flexible rubber mask over his eyes and nose. The only other apparel worn are swimming trunks and rubber swim fins for the feet. The equipment is recommended especially for use by prospectors, engineers, explorers, etc. It is possible to stay under water for long periods, if the equipment is used correctly. For copies of a booklet describing the equipment write to the Canadian Liquid Air Company Limited, 1111 Beaver Hall Hill, Montreal, P.Q.

•

Armco Drainage & Metal Products of Canada Limited, Guelph, Ontario, offer a four-page, two-colour bulletin entitled "Tunneling for Profit and Convenience".

(*Continued on page 620*)

WHAT IS *FRESH AIR* WORTH TO YOUR BUSINESS?

Not so many years ago, the ways in which air was used were few and elementary. Today, the control, distribution and uses of air are vital factors in practically every branch of industry and commerce. To meet the air needs of modern business calls for fan equipment designed and built to the highest standards of efficiency and to suit specific needs.

It is for these reasons that so many executives in all types of business consult a "Canadian Buffalo" engineer about their air equipment requirements. They know from experience he is an air specialist — backed by an organization whose research, engineering and manufacturing facilities have kept pace with industrial progress and have enabled them to solve the air handling problems in all branches of industry for over 40 years.

To determine the most efficient methods of using air in *your* business, be it large or small, call in a "Canadian Buffalo" engineer.

"CANADIAN BUFFALO" AXIAL FLOW FANS, give you peak economies on *straight-run* installations. Extra light for wall or ceiling suspension. Very quiet running and require practically no maintenance. Bulletin No. 3229-A will be sent free on request.

CANADIAN BLOWER & FORGE

COMPANY LIMITED

HEAD OFFICE: KITCHENER, ONTARIO

Engineering Sales Offices: Montreal, Toronto, Hamilton, Saint John, Port Arthur, Winnipeg, Regina, Calgary, Edmonton, Vancouver.

FAN EQUIPMENT FOR

Ventilating — Heating
Comfort Cooling
Process Cooling
Air Tempering — Air Washing
Exhausting — Blowing
Forced Draft — Induced Draft
Pressure Blowing
Cleaning — Drying

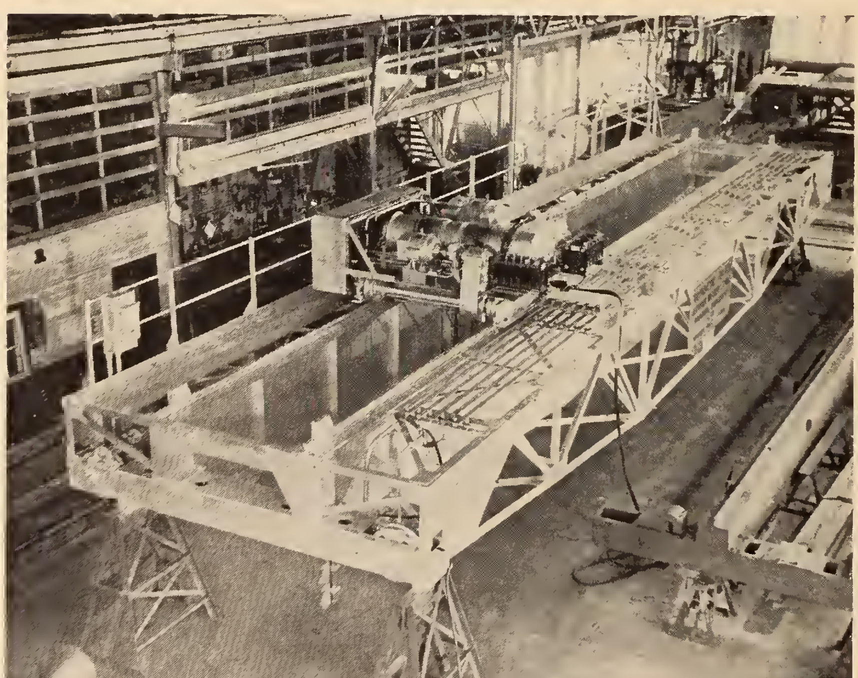
"CANADIAN BUFFALO" Limi Load FANS, give you the most a for your money where installatio is near *curved* duct connection Available mounted on silent "floa ing" bases, they are extremely qui running. Bulletin No. 3339 will b sent free on request.

BUSINESS AND INDUSTRIAL BRIEFS

(Continued from page 616)

AN ALUMINUM CRANE

Thought to be World's First



An Aluminum Welded Overhead Electric Travelling Crane of 15 tons capacity, 55 feet span, has been designed and fabricated by Provincial Engineering Ltd., Niagara Falls, Ontario. It is believed to be the first welded aluminum crane in the world. It is now in operation at the plant of the Aluminum Company of Canada, Kingston, Ontario.

Crane girders, end trucks, walkway, handrail, bridge conductors, trolley frame and all other structural parts usually made of steel are of aluminum alloy. The heat treated aluminum alloy used is 65 ST which has a typical ultimate tensile strength of 45,000 pounds per square inch and a modulus of elasticity of 10,300,000 pounds per square inch. As its specific gravity is 2.7 the weight is .35 that of steel. Girder web plates are rolled and all other sections are extruded. Technical information regarding the crane may be obtained from the manufacturers, Provincial Engineering Limited, Niagara Falls, Ontario.

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 32 — MONTREAL, OCTOBER 1949 — NUMBER 10

"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

* * *

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THE ENGINEERING INSTITUTE OF CANADA

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Indexed in The Engineering Index.

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CONTENTS

13,200 copies of this issue printed

COVER PICTURE

This issue of the *Journal* carries the official transactions of the First Western Hemisphere Conference of the International Committee of Scientific Management (C.I.O.S.).

C. A. Peachey, M.E.I.C., chairman of the Canadian Management Council and official host of the conference, is shown in the cover illustration (second from right), with the chief executives of the participating management organizations. From left to right they are: M. E. Alvaro, Brazil; H. B. Maynard, U.S.A.; Mr. Peachey, and Hugo de Haan, Geneva, Switzerland.

The organization chart of this world management movement is explained by Dr. de Haan in his opening address to the delegates. *Canadian Pacific Railway Photograph*

FOREWORD

On May 13 and 14 of this year, the Canadian Management Council (C.M.C.), the National Management Council (N.M.C.) of the United States, the Brazilian Institute of Scientific Management (I.D.O.R.T.), and The Engineering Institute of Canada, co-operated to sponsor the First Western Hemisphere Conference of the International Committee of Scientific Management (C.I.O.S.).

As engineers are becoming increasingly active and effective in management, it was agreed that the Conference could be held most advantageously in conjunction with the 63rd Annual Meeting of the Institute.

The Conference was an unqualified success. The speakers were eminent in their respective fields and their words carried an undeniable weight of authority. By arrangement with the Canadian Management Council this issue of the *Journal* will serve as the official transactions of the Conference.

L. Austin Wright

Editor.

Proceedings

of the

First Western Hemisphere Conference

of the

International Committee

of

Scientific Management

•

Quebec

May thirteenth and fourteenth

1949

•

Sponsored by

Canadian Management Council

Keynote Session

C. A. Peachey
Chairman,
Canadian Management Council

M. E. Alvaro
President,
Instituto do Organizacao
Racional do Trabalho (Brazil)

H. B. Maynard
President,
National Management Council (U.S.A.)

Hugo de Haan
Secretary General,
International Committee
of Scientific Management

The First Western Hemisphere Conference of the International Committee on Scientific Management (C.I.O.S.) was held in conjunction with the Annual Meeting of the Engineering Institute of Canada at the Chateau Frontenac, Quebec City, May 13 and 14 of this year. The meeting was sponsored and arranged by the Canadian Management Council (C.M.C.) with the co-operation of the National Management Council (N.M.C.) of the United States and the Instituto do Organizacao Racional do Trabalho (I.D.O.R.T.) of Brazil. The relationship of these groups to the parent body, C.I.O.S., is indicated by the chart on the cover of this issue.

In the welcome and keynote session the chief executives of the participating organizations outlined the functions and relationships of C.I.O.S. and its components and the aims and objects of the Conference.

C. A. Peachey

As chairman of the C.M.C., it is my agreeable duty to extend a warm welcome from the members of the Council to all collaborators at this Conference and to visitors from Brazil, the United States, Canada, and other places. As you know, this Conference has been planned as a joint work of the three Western Hemisphere National Committees of C.I.O.S.—those of Brazil, the United States, and Canada.

Institute Praised

At this point I wish to give full credit to the Engineering Institute of Canada for making this Conference possible. Almost a year ago, the Institute asked its members what subjects they would like to discuss at the Annual Meeting. At the bottom of a list of technical subjects was "Management". Most of those who replied indicated one or two technical subjects which were their specialities and, in addition, a great number of them checked the subject of management. The Institute therefore, decided to focus attention on management at this Annual Meeting. From these initial discussions, we conceived the idea of including, with the engineering approach to management, a general conference on management, which would be of interest to the members of the newly formed Canadian Management Council, as well as to E.I.C. members.

In the United States there have been a number of conferences devoted to the subject of management only, but in Canada, attention at meetings of this sort has not focused very sharply on the question of management. It has tended to become a bit of a sideline introduced along with other subjects. We believe that this Conference will show the need for public discussion of this very vital subject from time to time.

Work of C.M.C.

Some of you may be wondering about the work of, and the necessity for, the Canadian Management Council. Is it not just another Organization, and why should Canada be interested in assisting in the work of C.I.O.S. In the first place, the importance of good management cannot be overlooked. From even a short term dollar and cents view, it is the only protection industry has against a lower volume of business or a falling price market.

Knowledge of management, like most other things, is best acquired through a combination of theoretical study and practical experience. The one complements the other. The experiences of other countries cannot help but be of value to us, and I think you will agree that, in view of our favoured position in the world economy, Canada has a moral obligation to lend its support and share its know-how with this movement.

Canada is blessed with vast natural resources in the form of fertile soil, water power, forests, and mineral wealth; *but,*—and it is an important *but,* her prosperity depends in large measure on her ability to export her products to other countries on a reciprocal basis. Canada cannot ignore international affairs, has much to gain and nothing to lose by increased participation in international affairs.

Good Management Essential

We believe that, while Canada cannot afford the generous physical contributions being made by our good neighbours in the United States, we can and should contribute some of our industrial know-how. We should not remain aloof, but should support the rapidly growing interest in management in various countries in the world. This ties in with my earlier statement that Canada's prosperity depends on her ability to export. She can only export to solvent, well organized countries — in other words to countries which practice good management and keep up to date on its principles.

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Harold B. Maynard

As president of the National Management Council of the United States of America, I bring greetings from our organization to this first Western Hemisphere Management Conference. This conference is the initial tangible result of the forward-looking planning by the council of C.I.O.S., the International Committee of Scientific Management, at the time of the Eighth International Management Congress at Stockholm in 1947. The Canadian Management Council is to be congratulated on its initiative in planning and arranging for this conference. We in the National Management Council, are happy to have the privilege of joining with the Canadian Management Council and the Brazilian Institute of Scientific Management in the conference programme which is to follow.

At the time of the Eighth International Management Congress at Stockholm, the leading management people from several countries had come together for the first time in nine long years. As the congress progressed, and as speaker after speaker commented on the management developments which had taken place in his country during the war, all of us began to realize how much we had lost by our inability to exchange management ideas during the long interval between congresses.

C. A. Peachey

H. B. Maynard

As chairman of C.M.C., C. A. Peachey had an important part in the planning for the First Western Hemisphere Management Conference. He is works manager of the Telephone Division of Northern Electric Company in Montreal.
H. B. Maynard is president of the Methods Engineering Council, New York City. As president of N.M.C., he was mainly responsible for the American contribution to the success of the Conference.

International Conference Arranged

Then and there, the delegates resolved that such a void should not be permitted to occur again. The congresses, which are tremendously difficult and costly undertakings, could not be undertaken, from a practical standpoint, oftener than once every three or four years. So, to provide for the free exchange of management information between congresses, it was decided that a number of international regional conferences should be held. These, it was felt, could discuss a limited area of management and would help to develop conclusions that would be presented at future international congresses.

The idea was greeted with enthusiasm by the Eighth Congress delegates. At the next meeting of the C.I.O.S. executive committee which was held in Paris in November, 1947, two countries came forward with suggestions designed to give impetus to the conference idea. The French National Committee invited C.I.O.S. sponsorship of its conference on human relations problems, which was to be held at Royaumont near Paris in June of 1948. The National Management Council invited C.I.O.S. sponsorship of the Annual Time Study and Methods Conference, which is held in New York in April of each year under the joint auspices of the Society for the Advancement of Management and the American Society of Mechanical Engineers.

The executive committee of C.I.O.S. accepted these invitations, and the conference programme was thus set in motion. The conferences which have been held under C.I.O.S. sponsorship thus far, however, had

Dr. Hugo de Haan

Dr. M. E. Alvaro

In addition to his part in the opening session of the Conference, Dr. Alvaro presented two papers sponsored by the Brazilian unit of C.I.O.S.
Dr. de Haan came to Quebec at the request of C.I.O.S. president, Mr. A. Gabrielsson of Stockholm. During the opening session of the Conference Dr. de Haan gave a brief outline of the C.I.O.S. organization and its activities since its formation in 1924.

already been planned and developed by national groups. Therefore, this conference has the distinction of being the first regional one planned by more than one national committee and which, therefore, is truly an international undertaking. As such, it becomes a new and important milestone along the road of international co-operation.

Problems and Trends

As we look over the troubled international situation today, it is easy to become discouraged and to lose hope that nations will ever learn how to live together in peace. There are so many immediate complex problems which demand our attention, that we tend to overlook the long range trends. If we read the writings of any period, we find that there have always been those who gave themselves up to despair and predicted the end of civilization within the comparatively near future.

If we back away from contemporary writings, however, and look at the progress of civilization over the centuries, we can easily see how many gains have been made. From the early beginnings when each man stood alone and was regarded as a natural enemy by every other man, we can see how the idea of benefit through co-operation has grown. Individuals joined together into tribes, tribes grew into larger communal groups, communities merged into states, and states into nations. Now with the coming of the Atlantic Pact and the proposals for a United Western Europe, we see the trend emerging for the uniting of nations into larger and larger co-operative groups whose purposes are essentially peaceful. The day is coming when more and more national boundaries will become, as the Canada-United States boundary, friendly and unlocked front doors through which good neighbours pass.

More Peace Leaders Needed

The progress made toward more civilized relationships has not been made easily. The intervals of peace have been all too short and the periods of war all too frequent. Many more leaders working earnestly in the cause of peace are needed throughout the world, if eventually we are to have lasting world peace. Where are these leaders to come from? From all walks of life, of course. No one group has a monopoly on wise leadership. But I suggest that many, many leaders toward more peaceful human relationships are to be found today in the ranks of management. By developing our personal management abilities and spreading management knowledge through our participation in this conference, we are taking a very real step forward toward the development of a better, more peaceful world.

Scientific Management and Peace

The purpose of this conference, of the national committees who have organized it, indeed of C.I.O.S. itself, is the spreading of a way of thinking known as scientific management. I believe that scientific management has within itself the seeds of peace. Scientific management does not use force to accomplish its objectives. It analyzes the problems which it faces, examines objectively the factors involved, and seeks to remove by peaceful means the obstacles which interfere with successful accomplishment.

It is a reasoned, factual approach which eliminates personal bias as much as is humanly possible, and seeks solutions for its problems within the natural laws which govern each situation. An objective, factual treatment of problems is not always easy to achieve. We in management are human too, and we have our emotions, prejudices, and biases which handicap our judgments. Nevertheless, we do realize the essential soundness of the scientific management approach, and we strive through the activities of our management organizations to perfect our skills in its application.

Influencing Thinking

And this is tremendously important, for each man in management is a leader, the leader of the group he manages. It has often been remarked that the organization tends to assume the characteristics of its leader and becomes a reflection of his personality and attitudes. Thus each management man can influence the thinking of his group for the better as he himself grows and develops.

That is why this regional conference, and those which are to come, and the International Management Congresses of the future, are so important. Through them the principles and techniques of scientific management are spread to an ever increasing group of management men and women in many countries. Through them the attitude of a reasoned peaceful approach to the solution of problems is spread to the thousands of people who do the world's work. Thus a constructive force is generated by our management conferences and congresses which will ultimately influence the progress of mankind toward a better way of life.

This conference, through the speakers we will hear, will make its contribution to this end. May each one of us who participates receive from it personal inspiration so that, when we return home, we may help to advance the cause of scientific management throughout the Western Hemisphere.

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Dr. M. E. Alvaro

Mr. Chairman, ladies and gentlemen, I would like to tell you all that I am very happy to be here in this beautiful and historical city of Quebec, this prosperous Province of Quebec, and in this grand land, Canada, that is part of this unique and intriguing political organization known as the British Commonwealth of Nations. I bring greetings to you all from people who are interested in scientific management in Brazil. Brazil is your good neighbour, although it is over 7,000 miles away.

C.M.C. Congratulated

I think the idea of C.I.O.S. to establish these regional meetings is an excellent one and Dr. de Haan and his colleagues should be complimented. Furthermore, the Canadian Management Council should be highly complimented on its achievement. I think it is the youngest Council in our Hemisphere but it shows a great vitality because, in spite of the fact that it has been in existence only two years it seems to have grown and to have put on long pants now.

There are many definitions of scientific organization and down in Brazil we like to say, for public consumption, that there are many ways to do a job but we should always think that one of them is the best. I think the Canadian Management Council has applied this principle in the way it has organized this conference.

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Dr. Hugo de Haan

It is indeed an honour and a pleasure for me as secretary general of the International Committee of Scientific Management at Geneva, to represent, at this conference, C.I.O.S. and its president, Mr. Assar Gabrielsson. The president was anxious to come himself and asked me to express his sincerest regrets at being prevented by business reasons from making the journey to Canada. He sends to this conference, his best wishes for complete success in what he considers to be a most important event in the field of management.

Indeed, it is an outstanding event in the annals of the international management movement, when the three American members of C.I.O.S., two from the northern part and one from the southern part, come together for the first time, in what is so rightly called a Western Hemisphere Management Conference. Our International Committee regards this as a regional conference, since it is broader in its composition than any national one, yet narrower than the international congresses of C.I.O.S.

Scope of Conference

As you may know, in preparation for the next, the 9th International Management Congress in Brussels, similar conferences will be held in the near future in other regions. But yours is a regional management conference of a much wider scope, insofar as the region which it covers, the Western Hemisphere, consists of two continents and includes not only near neighbours like Canada and the United States, but also a far remote good neighbour, Brazil.

Let me explain the hopes that the International Committee attaches to this Conference in taking it under the auspices of C.I.O.S. Each time, when C.I.O.S. hitherto gave to this or to that particular country the chance to organize one of the spectacular triennial international congresses, it was with the conscious intention to bring to that country a creative stimulus which would eventually lead to the organization of its own national management movement on a broad central basis.

Other Conferences

As a matter of fact, beginning with the First International Management Congress in Prague in 1924, from which the eldest of the C.I.O.S. national committees, the Czechoslovak one, originated, each one of the following seven Congresses held since, in Brussels, Rome, Paris, Amsterdam, London, Washington and Stockholm, produced in each one of the respective countries what the chemists would call a coagulating effect: the individuals and groups of each country, competent and interested in scientific management, came for the first time together and merged into units.

This is the way it works: first, they combine for the purpose of preparing and organizing that International Congress, on behalf and on request of C.I.O.S.; then they undergo together the stimulating and inspiring effects of participating in an international show in their own common field; finally they are thus enabled and encouraged to create and maintain, after the Congress is over, a central management body, called a council or committee, which includes more people interested in management than ever before. They are thus in a position to represent the national management movement of that particular country within the C.I.O.S. organization in a self-conscious, representative, and constructive way.

This coagulation process was even witnessed in Scientific Management's own home-country, when the Seventh International Management Congress, convoked by C.I.O.S. in Washington in 1938, obliged the various individual management associations already in existence in the U.S.A. to combine constructively in the creation of a National Management Council, which is now —after some ups and downs—the undisputed management centre of the United States and which, under the admirable leadership of President Maynard, represents the American management movement here in Quebec as well as at any other international occasion in the realm of scientific management.

Similar coagulating effects such as those produced by the international congresses, we expect too, from this Western Hemisphere Management Conference, but on two other levels:— national ones for Canada, and continental ones for the Americas. As far as Canada is concerned, the situation is somewhat reversed. Here a national council was already in existence, and the decision to hold an international conference in Quebec was made, on the initiative of this council.

But I think our Canadian friends will agree that while the coagulative process within the Canadian management movement is progressing now in a satisfactory way, the Canadian Management Council nevertheless may derive from this Quebec Conference a considerable stimulus for growth and strength. This is at least our sincere wish concerning Canada.

A First Step

C.I.O.S. wishes to see in this gathering of three American countries the first step in a development, which, with the help of three pioneering countries, and of I.D.O.R.T. in São Paulo, may bring into being new management movements in other countries on American soil, in Mexico, Cuba, Argentina, Chile or any other of the South and Central American republics, so we may one day see Management Conferences developed into that of Pan American Management Conferences.

C.I.O.S. in any case would welcome extension of its membership to a still greater number of American countries on both sides of the Equator, so as to justify one day the convocation of one of its regular international management congresses under the sign of the Southern Cross.

C.I.O.S.

And now you may wish to know, what is C.I.O.S.? In the terms of its charter, C.I.O.S. is instituted "to study the application of scientific management methods and to spread knowledge of such methods among all concerned." It should "help to adopt such methods to all forms of activity where their application may issue in a larger return or improved working conditions."

For these purposes of research and information, C.I.O.S. has participated in the past, from 1927 to 1933, in the conduct of a special International Management Institute, which acted in Geneva as a clearing house until the national management movements in the various countries reached such a degree of maturity as to be able to carry on the necessary research work themselves and to secure by their own efforts the necessary information on progress in other countries.

When this stage was reached, the

task of C.I.O.S. became one of mere international co-ordination and of service to the various national movements as the international centre and organizational focus. As such it appears in the triennial management congresses, the next of which, will be held at Brussels, on invitation of the Belgian National Committee of Scientific Management in 1951.

Speaking in terms of Lake Success and of the U.N.O. Family, C.I.O.S. is a "non-governmental organization with consultative status to such 'Specialized Agencies' as U.N.E.S.C.O." Speaking finally in terms of organization, C.I.O.S. as a committee is a private international federation of the representative national management bodies of 16 countries, namely: the U.S.A., Great Britain, Australia, Canada, Brazil, France, Belgium, Netherlands, Czechoslovakia, Switzerland, Greece, Austria, Denmark, Finland, Norway and Sweden.

Constituent Bodies

It appears from the memberships chart that, constitutionally speaking, there are two types of C.I.O.S. members:— (a) The elder countries, like Belgium, Brazil, France, Greece, Netherlands, and Czechoslovakia, which have preserved the original form of national committees, being societies composed of a great number of affiliated members, collective ones and individuals. (b) The newer countries which have formed councils which are not composed of affiliated members, but constitute what we have come to call "roof-organizations". This is the type of national management council adopted by U.S.A., Great Britain, the 4 Scandinavian countries and—mutatis mutandis—by Australia, Austria and Switzerland.

This is the way this works out—the most representative management associations in the country combine with other organizations, which are competent in specialized fields or functions of management or take a professional interest in scientific management as a whole, and all these groups form together one single central management body to which they belong as constituent or associated members.

In contrast to the first category or committees, the second one of councils does not as a general rule admit the affiliation of individuals as members, and only 2 of them, the American National Management Council and the British Institute of Management admit the affiliation of individual companies or corporations as well as educational bodies in the management field. All the management councils are roof-organizations, federations of a representative though private character, with the only exception of the Finnish Council which is described as a governmental committee, and the British Institute of Management and the Austrian Board of Productivity which are central institutions favoured by their respective governments.

Many of the councils include amongst their constituent or associated members their respective federations of industry, employers' associations, chambers of commerce as well as trade unions, chambers of workers and other organizations of employees. They all include the professional groups of engineers, consultants, accountants, psychologists and others, and cover besides industry, as a central field of action the neighbour-domains of commerce, transportation, banking and insurance, agriculture and home managements as well as, last but not least, public administration.

This is the field of action of C.I.O.S., this is its vital space in which it moves, the broad background on which it stands. Measured in figures, this background is composed of about 15,000 affiliated members of the committees and about 170 constituent and associated members of the councils and institutes. As each one of these latter have memberships of at least 1,000, the 170 organizations represent about 170,000, to which some 15,000 may be added on account of the still larger membership figures of the American management associations.

Thus we arrive at a grand total of about 200,000 individuals and organizations, interested in management in the C.I.O.S. countries, and connected through the national committees, councils and institutes with our International Committee as an over-all roof.

May I now in conclusion turn to Canada, which country, as I have already learned in the primary school in Austria, is bilingual, so that I may be allowed to address our Canadian friends in French: Mesdames et Messieurs,

C'est en ma qualité de citoyen de la République et Canton de Genève, donc de la partie romdule de la Suisse, que je tiens à me servir ici, dans cette belle ville de Québec, centre de la partie française du Canada, de la douce et belle langue française, puisqu'elle nous est commune.

Le Canada n'est entré au C.I.O.S. que tardivement, en 1947, donc plus que 20 ans après lé fondation du Comité International en 1926. La raison pour ce retard n'est aucunement que ce pays, son industrie, ses entreprises auraient été en arrière d'une évolution moderne, qu'ils n'auraient connu le "scientific management" plus tard ou plus imparfaitement que les autres, que leurs "managers" auraient hésité ou tardé plus que d'autres a appliquer les principes et méthodes les plus perfectionnés de l'organisation scientifique.

Le contraire est vrai et nous savons tous que le Canada, dans notre domaine aussi bien que dans tant d'autres, a toujours marché et marche toujours au premier rang du progrès moderne. Si ce pays n'a pas jugé nécessaire jusqu'à il y a quelques années seulement, d'adhérer au C.I.O.S. et de fédérer à cet effet ses propres groupes et individus intéressés dans le "scientific management" en une organisation nationale et centrale, c'est que les Canadiens n'en ont pas ressenti un besoin très urgent.

Le raison s'y trouve, aussi, dans le caractère bilingue de votre pays: puisqu'on parle l'anglais aussi bien que le français au Canada, cet heureux pays est relié directement avec les deux foyers originaux du "Scientific Management" aux Etats-Unis et de l'organisation scientifique en France.

La contribution du Canada à l'oeuvre internationale a d'emblée été riche et précieuse. Il suffit de lire les rapports annuels de l'Institut d'Administration à Montréal pour se rendre compte de la manière sérieuse, approfondie et constructive avec laquelle les adeptes Canadiens du "Scientific Management" se penchent sur les problèmes fondamentaux de l'organisation et de l'administration.

Par une étude méthodique de tel ou tel ouvrage classique, tel celui de Constock Glaser, ils arrivent à se former eux-mêmes une opinion scientifique, une terminologie unifiée, une doctrine basée sur les expériences et applications pratiques propres à l'industrie Canadienne.

Il est donc infiniment précieux

(*Continued on page 668*)

Planning & Unified Management of Industrial Apprenticeship in Brazil

by

M. E. Alvaro

President, I.D.O.R.T.

Dr. Alvaro is a doctor of medicine and a doctor of ophthalmology and has been president of I.D.O.R.T., the Institute of Scientific Management of Brazil, for the past fourteen years. He has taken a great interest in industrial medicine, and in improving conditions for employees in Brazil. Results of that effort have led him into the field of management.

The subjects of Dr. Alvaro's address have particular significance in his own country and it is expected that his paper will be published in his own language in technical journals in Brazil. Only a brief abstract has therefore been included in the *Journal*.

Brazil's 80,000 industrial enterprises employ about 1,500,000 workers, some 20 per cent, or 300,000 of whom are skilled. The annual quota of replacements required, based on an assumed 30 year period of worker activity, is one thirtieth of this total per year or 10,000. Extrapolation of Brazil's industrial growth in the past indicates the present requirements for replacements will have to be doubled within 30 years. Thus provision must be made for training 20,000 apprentices annually.

Not all of these 20,000 require the same level of preparation however. The proportion of those requiring a higher degree of training is one out of every four. In other words, 5,000 require 100 per cent training yearly, the balance 60 per cent and 30 per cent preparation. To supply this need there is: (1) the network of industrial schools maintained by the various levels of government, and (2) S.E.N.A.I., the National Service of Industrial Apprenticeship, maintained by Industry through the national and local associations of manufacturers. In the case of the former, needs are increasing and better equipment is needed; while due to non attendance, the numbers turned out are small. They can supply about 5,000 apprentices a year.

In the case of S.E.N.A.I. schools the teaching is more specialized, deals with apprentices already working in industry, and has to be conducted more on a mass production basis in order to turn out the balance of 15,000 apprentices annually.

S.E.N.A.I. conducts two types of courses:

(1) Pre-vocational courses for ages 12-14 from families of industrial workers, and trainees courses for technical training for ages 14-18.

(2) Rapid courses for teaching elementary features of certain specialties (minimum age 16), and post graduate courses (minimum age 18), for increasing technical efficiency. Industries which are covered are clothing, building, furnishing, spinning and weaving, printing, mechanics, and electricity.

S.E.N.A.I. schools are maintained by a contribution from industry of 1 per cent of payrolls. They are conducted under guidance of the national council of S.E.N.A.I. and are under supervision of legislative councils composed of representatives of industry and the Ministers of Education and Labour.

Under the older methods apprenticeship lacked guidance, and young industrial workers received only routine training, with mediocre results. S.E.N.A.I. seeks to apply rational methods in selecting apprentices and in imparting technical knowledge. The teaching is directed primarily towards the psycho-social and professional aspects of the pupil, with the objective of making him think for himself, by giving him progressively more difficult problems to solve. Extra curricular activities are not neglected. Even social training and recreation are included in the courses, the purpose being not merely to teach, but chiefly to educate, to make the apprentice healthy morally, physically, and technically conscious of his responsibility to the community.

Of the original programme comprising 70 schools, 29 are in operation and 14 more are under construction. In December, 1948 there were 87 S.E.N.A.I. school units, 20 of them in industrial firms under guidance of S.E.N.A.I. and 7 maintained by S.E.N.A.I. under agreement with existing professional schools. Registration last year totalled 18,000,—15,000 of whom were workers between the ages of 12 to 14, and 3,000 young people and adults. The 14 schools now building will, when completed, take care of another 7,500 apprentices. To date 10,300 apprentices have received letters of trade or certificates of aptitude.

S.E.N.A.I.'s longer term plan calls for establishment of 150 school units throughout Brazil, which will be able to take care of 31,000 day pupils and 20,000 workers in night classes. Thus roughly 50 per cent of the planned programme has already been carried out.

Discussion

Erwin Schell[1]—I wonder if Dr. Alvaro would care to enlarge on the civic activities and training which take place?

M. E. Alvaro — Lectures are given on data, on the history of the country. Stories are told about the great citizens and their achievements. Parades are held on national festivals. All those things, of course, are optional. It is just to build up their morale and make them feel proud of the country where they were born but where their parents were not born and they have not found out quite where their allegiance lies.

I. P. Macnab[2]—I would like to ask Dr. Alvaro two questions: Firstly, do the younger students come in for selection as to ability and mental capacity, and is any incentive granted for students showing particular improvement and ability. Secondly, what is the situation in Brazil with regard to unionism, and what co-operation or what arrangements work out with these young men who come into the industry where unionism is working?

M. E. Alvaro—The screening is done by the several classical methods used, different tests being given to students to find out if they have more attention or more imagination, for the mental part; and then manual dexterity, by all the tests we know, seeing if their movements are co-ordinated, and according to charts established they are advised to take this or that trade.

There is no incentive system, but if they are eager to learn and have the ability, they are taught whatever they want and whatever is suitable for them. When they graduate they have a certain amount of incentive in terms of increase in pay. I do not think it exists, otherwise.

There are no unions in our country in the sense that there are in the United States and Canada. Our labor legislation sees to it that all workmen are compelled to join what they call a Syndicate. In our country it was the government that induced labor to organize, because labor was not alert enough to do that on its own. They did it in a haphazard sort of way, not in an organized way, as in the United States or Canada. These Syndicates do collective bargaining, and our legislation sees to it that whenever there is a dispute they will have to handle it through legal channels. They sit in conferences. That does not mean that we do not have strikes, because we do.

C. A. Peachey—I was wondering how you train the teachers. Was it a slow job?

M. E. Alvaro — It all started with this centre to teach railway apprentices. From that nucleus they developed other agencies to train teachers. Generally they prefer to use school teachers of different degrees who have already some basic knowledge about teaching, and then train them from there on. Progress was slow.

Delegate—It seems you are filling a need that we are finding more and more apparent. We educate them so far and then toss them out into the street and hope they will find an adjustment. Do you find that apprentices move into industry in fairly stabilized form? Have they been able to choose young enough, when they come in there, to be able to carry through with these jobs into industry? Do they bridge that gap which we have?

M. E. Alvaro—We are just trying this out now, and those young boys were going to work anyway, because there are financial reasons in their families why they would have to go to work, so they are sent to one or other of these schools. With this system they work one day, and the next day they go to school and some screening is done and vocational guidance is given. We try to find out what the ability of each boy is, and for what he is most suited. If he follows the advice or not, that is another question. There again, financial reasons might be behind his decision. In my country education is not compulsory to the age it is in the United States and. I believe, in Canada.

C. A. Peachey—In Canada one of our troubles is to get enough people entering the trades. There is a strong tendency to enter the so-called white collar jobs. Did you think this scheme might fill up the jobs in industry?

M. E. Alvaro—I think a little publicity along the lines we have here is a good thing.

H. E. McCrudden[3]—Dr. Alvaro mentioned a means of producing skilled workmen. But the next step is from the skilled workman to the straw boss or gang boss or even foreman. Would it not be an incentive to the trainees in the trade schools to know that they could become foremen or other leaders or educators within industry? How do they get that very important group, you might say that first line supervision, whether it is recognized or not?

M. E. Alvaro—That is one of our greatest problems. The problem was a complex one. We had to start from the bottom by training our workmen to work properly. Now the second step will be to train the foremen, and before I left São Paulo we had already done considerable planning. Dr. Manja and his assistants have drafted a plan by which in a similar way industry would pay for the training of these foremen that are going to be useful in industry, and industry would manage it in the same way. Perhaps it would have been wiser to go from the top to the bottom.

C. A. Peachey—I think you have to do it both ways, start it at the bottom and get them up a bit, then start at the top and work down.

Hugo deHaan — It looks as though the American Training-Within-Industry scheme (T.W.I.) is already in application in Brazil. This special training scheme was developed as an aid to industry during the war, for military pur-

(Continued on page 668)

[1] Dept. of Business Administration, Massachusetts Institute of Technology.
[2] General Manager, Public Service Commission of Halifax.
[3] Staff supervisor, Bell Telephone Company of Canada, Montreal.

Human Engineering in Management

by

Lillian Gilbreth

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With an Introduction by

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Dr. Gilbreth was the principal speaker at the Management luncheon on Friday, May 13, at which I. P. Macnab, vice-president of the Institute for the Maritimes, presided.

Dr. Gilbreth's reputation and experience in scientific management and in the engineering profession are unique and it was particularly appropriate that Miss Elsie MacGill, who occupies a similarly unique position in the engineering profession in Canada, should have consented to introduce Dr. Gilbreth to the assembled delegates and their ladies.

Dr. Gilbreth's account of some of her experiences in the application of scientific management principles to the phenomenal war production effort of the United States was considered by many to be the highlight of the Quebec Conference.

Miss MacGill's introduction provides such an effective emphasis to the principal address that it has been included in full.

I. P. Macnab

Distinguished guests, ladies and gentlemen, it is our special privilege to have with us today two very distinguished ladies. I am going to introduce to you Miss Elsie Gregory MacGill, who will introduce to you our principal speaker.

In May, 1938 for the first time in the history of The Engineering Institute of Canada, a woman was elected to corporate membership. The new member was Miss Elsie Gregory MacGill, a bachelor of applied science from the University of Toronto and a master of science in engineering of the University of Michigan. She has done two years' graduate study at M.I.T. towards her doctorate. She is an Associate Fellow of the Royal Aeronautical Society.[5]

In 1939 Miss MacGill was appointed chief aeronautical engineer for the Canadian Car & Foundry Co. at Fort William. In 1942 she was elected chairman of the Lakehead Branch of the Engineering Institute, the first and only time that a woman has been chairman of a branch of the Institute. In 1940 Miss MacGill was awarded the Gzowski Medal of the Institute for her paper "Factors Affecting the Mass Production of Aeroplanes". In 1946 she accepted an appointment with I.C.A.O. in Montreal as technical adviser, thus adding another to a long chain of "firsts" for women.

She was the first woman in the world to receive a master's degree in aeronautical engineering; the first woman on this continent to become chief engineer with any company; and the first to design, build and test her own aeroplane. She is at present carrying on a consulting practice in her specialized field in Toronto.

[5] At the general meeting of Royal Aeronautical Society in May, this year, Miss MacGill was elected to Fellowship in the Society.

Miss E. G. MacGill

Mr. Chairman, ladies and gentlemen: The years of our guest speaker's engineering practice are dotted with milestones of achievement, and latterly with many recognitions of her work and these are so multitudinous that I can only bundle them up and hand them to you in parcels. She has *earned* three university degrees, including a Ph.D. She has been awarded six more—from Russell Sage College, California, Smith, Rutgers, Michigan, and Brown Universities—honorary degrees which, if you ticked them off like a metronome, or like one of Dr. Gilbreth's own time study clocks, would go: doctor, doctor, doctor, doctor . . . .

In 1944 she was awarded the Henry Laurence Gantt Memorial Medal by the American Management Association and the American Society of Mechanical Engineers. She is an honorary member of A.M.A., the Society of Industrial Engineers, the Society for

Advancement of Management, and the Engineering Women's Club of New York. More glamourously, she was chosen "Woman Of The Year" in 1942 by Scripps College and, in 1948, by the American Women's Association.

"What on earth was Dr. G. given all these awards for?" "What did she do?" When I tell you that, I shall tell you what she is like, for the truest possible picture of a person is the work of that individual.

She has carried on concurrently the four professions of the psychologist, the engineer, the author, and the professor; so efficiently dovetailing them into one another that she has earned the moniker of "the compleat engineer."

As engineers, Lillian and Frank Gilbreth pioneered the field of efficiency engineering in management, the development of the principles and techniques of motion study, and their application in industry and agriculture. They originated motion study, and since motion study has become an integral part of our technology, this charge is tantamount in its enormity to accusing one of devising the slide rule or log tables, or even the wheel or the lever.

They originated the progress chart, micro-motion photography of work movements, and the chrono-cyclegraph. They adapted these to plant operations in foundries, machine shops, laundries, textile factories, automotive works, and optical goods works. They installed management systems in some 200 plants. They studied human fatigue scientifically. Much of this work they pioneered together and later Dr. Gilbreth continued it alone.

As an author, Dr. Gilbreth's first book was "The Psychology of Management." Then she collaborated with her husband in writing four more: "Applied Motion Study," "Fatigue Study," "Time Study," and "Motion Study for the Handicapped," an investigation for disabled soldiers. Having laid herself open with all this efficiency stuff, she applied it to the problems of the hausfrau and wrote two more books, "The Homemaker and Her Job", and "Living with our Children," and she could certainly write without brashness by this time on these themes for she had qualified as an expert, having twelve children of her own. In 1945 she collaborated with others and wrote "Normal Life for the Disabled," and in 1947 "The Foreman and Manpower Management." That is a total of nine books, and she has written many technical studies besides.

Dr. Lillian Gilbreth and chairman of the luncheon session, Ira P. Macnab of Halifax.

As a professor she lectured regularly on the staff of Purdue, Bryn Mawr, and the Newark College of Engineering, and gave series of lectures at a heaping handful of other American universities—M.I.T., Yale, Ohio State, Michigan, Harvard Business College, Smith College, Teachers College, and in European centres also. During the war she acted as consultant for a number of firms. She served on a presidential committee on unemployment. She spent years on the New Jersey State Board of Regents and during the war she was on the Civilian Defense Committee for New Jersey. She has worked on innumerable committees for education and advancement.

Dr. Gilbreth is licensed to practice professionally in New Jersey and in Indiana. She is a member of many learned societies, including the A.S.M.E., the American Psychology Association, the Women's Engineering Society of London, the Academy Masaryk of Czechoslovakia, the Institute of Scientific Management of Poland, the Institute of University Women, the Committee of College Women Students and the War, and the American Council of Education.

The scope of her accomplishments is something that quite makes you gasp. Each of these would be a lifetime accomplishment in itself for an ordinary person. I feel that Dr. Gilbreth is someone very much out of the ordinary, that she is like television, a tour de force. I think you will understand that I deem it a privilege and a great personal honour to introduce to you today Dr. Lillian Gilbreth.

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Dr. Lillian Gilbreth

Mr. Chairman, Miss MacGill, Honored Guests, ladies and gentlemen, I only wish my family could have heard Miss MacGill's introduction. I think perhaps my stock would have gone up.

It is such a pleasure to be here with you and I want, first of all, to thank our beautiful hostess city for giving us such a fine welcome, for giving us the sunshine and the flowers and I am grateful for the privilege of being with one another. I want to thank the Engineering Institute of Canada who asked me a year ago to come here to speak to this meeting, so that the date was the first date in my diary for 1949. I want to thank the Committee of our Western Hemisphere Conference, and especially the Canadian Management Council, who made up the programme, for including this talk in our conference. I cannot begin to tell you how pleased those of us in the management field are that we are here with the Institute today, having an opportunity to have our very first Western Hemisphere Conference here with you.

I would like to say a few words today on the place of human engineering in management and I want to tell you, first of all, what this talk is NOT. It is not a talk on some mythological person called a human engineer; that would be barbarous. It is an attempt to show that all engineers concern themselves with the human element, and that all engineers concern themselves with management, whether they happen to have management in their own titles or not.

I am not at all sure that "human engineering" is the best phrase that we can use when we speak of "Humanics", and all sorts of other words that have been suggested. I think however, that you will rather like the juxtaposition of those two words "human" and "engineering" because, by definition from the very beginning, engineering was "the utilization of natural resources for the benefit of mankind", and mankind certainly came into the field of engineering at that time. When later, the definition supplemented itself by saying "the use of natural resources and of human resources for the benefit of mankind," then I think the emphasis was placed where it should have been, and where it has been ever since.

In the management field we felt the emphasis on this human element from the earliest days. As you go over the literature of the pioneers and find the names of Frederick Taylor, Harrington Emerson, Henry Towne, Henry Gannt, James Dodge—and Frank Gilbreth, I am proud to say—and the others who worked in that field, you may not find all the phraseology and vocabulary, or even the emphasis on certain human elements that you would find in similar literature today.

You must remember that not only were those early books and papers written by technical people, by engineers—all of them in technical terms and in the language of that time—but that the human sciences, the social sciences, had not advanced in that time to the point where they have now. Looking for the seeds of what we have today in the work of these pioneers, you will find them there. Trace back, if you will, many of the things that are happening today, and you will find that they started there also, because really it was partly because of the urging of this group that the development of economics and sociology in education, in psychology, and psychiatry came about.

These pioneers of ours were not primarily academic people. They were primarily people out in industry, like you and me, who faced the problems of their time and who asked for help in their solution. It was largely because they wanted to select people more effectively and to be able to screen them properly, and to see that they had ample opportunities; and then to train them to take these opportunities and fulfil their obligations, that the colleges started to work out intelligence tests and other sorts of things which have come into industrial and educational use.

Enter the Psychiatrist

I remember well the coming of psychiatry into industry. It came because we found problem people in industrial plants. We found people we wanted to promote who did not think they wanted to be promoted. We found people who insisted on being promoted although we could not see any aptitude or equipment for promotion. There were some who thought everybody hated them, no matter what jobs they went to. There were a number of others for whom there was no psychiatric term but who were sometimes simply called "problem people".

Dr. Sothern, one of our pioneer psychiatrists, did much of this work. He found people to appear before small informal groups of engineers, and this indicated not only the similarity of the problems they faced with the ones our people faced in industry, but the causes of these problems and the ways in which they might be met. So we feel that, from the very beginning, both in realizing that the responsibility lies very largely in the human field, and in turning to others for help to meet these responsibilities, the pioneers did a fine and adequate job.

So it went on until the first world war. You will remember well what happened then, how all of a sudden we found that we needed everything we knew about handling the human element. We did a much better job during the war years than we had done in the peace years, not only in the war and in the government activities of the various countries involved, but also in industry, as we called in these people who know more about handling this human element and asked them to lend a hand.

It was a big achievement, calling back into industry people who were old and who felt they had finished their term of usefulness. But they came back again, either to take up their work or to teach. People who had handicaps of one sort or another demonstrated that if one gives what he has, even though he thinks it is very little, it often turns out to be a great deal. And so they progressed in the working out of new techniques.

After the first world war there was the usual dip in practice and an integration in theory, perhaps, and many new developments along the line of human engineering. Then we come to the second world war, which is all too vivid in the minds of all of us. Of course we were all doing war work, no matter whether it was in the home, industry or business, the government plants or the armed services. Perhaps you know how, even more effectively, we began to look for all the resources possible in terms of the human element, and what makeshifts we had to use in many cases.

Wartime Problems in Humanics

In the little Navy plant where I worked — and I am sure this applies everywhere — it seems to me we had new people of every capacity. So many of our people who had been operating machines, and those in the personnel departments as well, went either into the armed services or into government departments, or into work in more critical industries. We experimented in the promotion of workers who had no experience in leadership, to be foremen and superintendents. We called in auxiliary groups, as I suppose you did also. These were to come in and act as counsellors, to help relieve the over-burdened department heads. I recall an incident with one of the supervisors in this New Jersey plant, where we had job specifications for our counsellors. This supervisor was having trouble, and we asked her what we could do additionally to help her and she said: "I think I want someone who will let the women cry on her shoulder, so they won't take up so much of my time."

I decided that it was probably the least part of the job that these women were doing, but it did give me an idea that these helpers had to be warm, sympathetic people who could give what was really first aid, to take over wherever they were needed, and we found, too, that they were of great value to the personnel group themselves.

We had a lot of youngsters coming in to do tests. Some of them had their doctor's degree and some had a master's degree; but some of them did not have any degrees at all. They had nothing except great courage and ambition and assurance. They managed very well, and really I think they felt that after all, if one did have youth and courage, what need for all these academic trappings?

We had experts come in—and I name them so advisedly, because they came as such — who were highly critical of our procedures. I remember one, a psychologist, who came stamping in one day. I had met him once before and looked upon him with a wary eye. He announced that certain changes would have to be made at once, and asked me if I thought he should go at once to the top management offices and tell them so? I said: "Do let them have their lunch first, so that they may be in some slight measure fortified for what you have to say to them." I don't think that he did wait so long, because he did not return after lunch. I never saw him again, and I fear that his suggestions were not too well received.

There were some amusing and some stimulating situations, and out of that whole experience I feel many of us in industry did gain a great respect for what is going on in this whole field of the related sciences. As we went on we heard a great deal of talking about the lag between social development and technical development. Perhaps we felt a bit guilty, being engineers, and therefore involved in this technical development.

Integration of Technical and Social Development

We began to see some hope of an integrated application of all these techniques, which would come about because we had learned to understand each other a little better as people. Since that time, I think we have been making distinct progress in every field. Take, for example, the physical well-being of all the men and women out in industry and agriculture, in the home, in the community. As we study the progress made we begin to realize more completely that the home is the centre of the individual and group activities of every one of us, because it is there that we learn our fundamental habits and ways of thinking about things. If it is a well-integrated home, with a happy family, when we go out into the world, whatever job we take, we do represent our home and our family, and that sort of thing has led to such an integrated attack on such problems as safety, for example, and as the handling of fatigue, and health legislation, and has carried through with all these activities and has made distinct progress.

Take the matter of bio-mechanics. Out in these little factories we found many people working, both young and old, and many women who had not done this kind of work before. I refuse to say "they had not worked before", for anyone who had been a homemaker certainly knows what it is to work; but they certainly had not had to live the kind of life that one did live during the war years. Many of these women were homemakers, and that particular job of home making was not the simple one it had been before the war. Now it was necessary to go out and stand in line to get provisions for the family and then carry them home. I am sure all but the youngest in this group will remember what that was like. The matter of transportation; taking the crowded subways and buses; or if you had a car, parking it so far from work that you sometimes wondered if it was worthwhile using it at all.

All these things contributed to the fact that many of these women got extremely fatigued, and small wonder. All the muscles which were called into use on this new job which had hitherto not been used, caused a good deal of pain and fatigue and often discouragement. So we looked around and brought in a group of people who were interested in physical education. In my particular plant we could not buy one or beg one or steal one, so we borrowed one from the school department. This man came in and set up a gymnasium. The women on the job began to talk about it, and before long they were interested in attending the exercises, and this man conditioned them in such a way that they were able to go through all their work without undue fatigue. They could have a work-out in the gymnasium and go away completely rested up.

It did do the job, and I speak from experience because I was one of those persons who came to work in the very early morning and stood up on the subways and worked until the day shift came on. Then when the time came for the day shift to come on, I was ready to look for a pick-me-up, and went into the gymnasium. With ordinary clothes on, the rather simple working clothes we wore, I would lie down on the mattress and have a real work out, and I can testify that it does the job.

I must not forget to tell you that we learned one other technique. If you are tremendously tired listening to a long after-luncheon talk, you cannot, of course, jump up and down, but you can bend over and untie your shoe lace and tie it up again very carefully. By the time your head comes up you can endure it for another half hour.

There is one other thing I want to tell you, in fact, two other things. One is that we finally called it "bio-mechanics" because we thought it would appeal more to the engineering group than if we took a technical name from the medical dictionary. I could not find just the word I wanted in the engineering vocabulary, and it was our librarian who finally found this term.

After a few unfortunate experiences in the plant, we decided to set up this department as a Medical Department. I do not want to disparage any of the medical people—I have the greatest respect for them — but to get real results when it became necessary to get certain people off the job, all we had to say was, "Doctor's orders", and we achieved what we could not in any other way. So you see we also learned a good bit of diplomacy technique, as well as the use of other techniques of one sort or another. I do know that this whole work, this physical up-keep and education, physiology and physiotherapy are very important things.

Intelligence Tests

When it came to the field of the intelligence, of course we used every possible test that we could get there. I think one of the fine things going on today is the fact that we are beginning to evaluate and combine and work out better ways of making tests.

There is one other thing I want especially to say because of the fine talk which our representative, the president of the Brazilian Management Conference, gave us this morning. We had a wonderful paper from him on what is happening in Brazil. He is to be congratulated on his apprenticeship plan. We learned a great deal about the Brazilian adaptability to meet changing situations and to do what is good and necessary for them. It may be that this would not be good for you here in Canada or for us in the United States, and that various practices in Canada or the United States would not be good for Brazil, but the fact that we constantly have to check things, that we are able to check things that we may see and think desirable against our our problems and our own needs, allows us to hold up our heads and say, " We have checked and we are working that out in the way that meets our needs." That, after all, is the measure of its effectiveness and how much it is like anyone else's logic.

We find we are making great strides in this whole field of handling human efficiencies. This early work in the psychiatric field has gone on, and is largely being carried out by two groups. In the field of clinical psychology Dr. Alexander H. Leighton has written a book called " The Governing of Men ". When I asked the president of our Management Council if he had read it, he said, " The author got a medal for the book some time ago," which led me to get it and read it. That fine book, dealing with tensions, made such an impact on all of our thinking. Dr. Leighton spent a lot of time with the Japanese during their movement from the West Coast into the centre of the country. The whole thing will carry you along, and you don't think why things happened, because you are reading about what happened and when and where. Then when the ground is well covered he goes back and takes up the " why " in every one of the items. You can apply it not only to this but to industry, to business, to agriculture, and to home situations as well.

Education Becoming More General

Now what about the trend? Do we see anything that we think marks the lines of future progress? In the first place I think in the field of education we do. The fact that technical education, the education of the engineer, is not becoming less technical but is becoming in many ways more general, is putting more emphasis on this whole field of teaching people to get along with themselves and others, giving them that art of communication, so that they really have practice in getting on well with other people.

That, I think, you know. Wherever you go it comes back to you. Dr. de Haan comes over to us from Swiss headquarters in Geneva, from C.I.O.S., being the International management group. In fact, all over this world the interest in this human element is penetrating into our engineering education, into mechanical, electrical, civil, in fact all engineering. In our management engineering, of course, more time and even more emphasis are placed on these things, with people going to all parts of the campuses to pick up what is needed. I am looking forward eagerly to this talk tonight on Food and Engineering. I do hope to tell the speaker that our first book on work simplification in agriculture is just off the press, so that we not only have a great deal to learn about what has been done in the field of agriculture and engineering but a little to contribute as well.

Then, too, in the idea of adult education and continuous education, and education in the plant and out, a point, also, which Dr. Alvaro made so well when he spoke to us this morning, we see great importance. Then we think of other important things, and in some ways, it seems, the most important of all is this fact that we are beginning to erase these imaginary lines between the different sciences. You see it on very small projects, for example. If you will allow me, I am going to tell you about just one.

In the fall the New Jersey Heart Association decided to set up a model kitchen for the use of women who have heart trouble. Of course, we could have called in an industrial engineer to do the job, or we could have called in a home economist to do the job or, as some one suggested, we could have called in an experienced and effective home maker. But we thought we would make a committee project out of it, and use every resource we possibly could, so we invited a large group of people; psychologists, psychiatrists, family relations people, architects, doctors of course, including some of the foremost psychosomatic medicine men, and all sorts of people to act on this committee, and there was a great deal of talk about it.

One idea put forward was that it was all wrong, that we were putting too much emphasis on the habits of the woman with the heart trouble, that it would worry her and make her think she was in more danger than she actually was, that this was not the ideal way, at all.

However, we combined the ideas of all these experts, we studied them, and decided what would be good for her, or for a woman with tuberculosis, or any other difficulty, or what would be good for any other woman — or man, for that matter, because what we have been trying to do is to avoid any unnecessary expenditure of time and energy, and to make the work interesting and profitable. So we set it up and there it stands, such as it is, an indication that we people of all types of viewpoint, got together on a project and did something very worthwhile.

I will say, off the record, that one woman objected to this project on the grounds that it would not be good for women to have so many conveniences. " What is going to happen to our hips," she cried, " if we have this sort of kitchen, because we need to bend and stretch and run and do all these things to keep from getting fat? " I know most of my friends really would prefer to do their bending and stretching on a golf course instead of in a kitchen. But of course if she wants to do it in her kitchen, let her do it there.

I want to pay a well-deserved tribute to the men of our respective countries, because when they came into the kitchen, machines came in, too. Let any man do

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MANAGEMENT—*A TRUSTEESHIP*

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A PANEL DISCUSSION HELD ON FRIDAY, MAY 13

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Chairman

J. M. Juran

Department of Administrative Engineering, New York University

Participants

C. M. Anson, *Sydney, N.S.*

R. W. Diamond, *Trail, B.C.*

T. E. Purcell, *Pittsburgh, Pa.*

W. W. Tangeman, *Cincinnati, Ohio*

Dr. J. M. Juran—Ladies and gentlemen, I would like to introduce to you the members of our panel who are going to discuss this afternoon the subject "Management—a Trusteeship." Mr. C. M. Anson is a native of England. He spent his early years and received his preliminary education in Australia, came to Canada in 1920, and obtained his B.Sc. degree in metallurgy at McGill University in 1925. He joined the Dominion Steel & Coal Corporation as a labourer and progressed through the ranks and is now general manager of that organization at Sydney, N.S.

Mr. R. W. Diamond is a graduate of the University of Toronto, 1913. He joined the research department of the Anaconda Copper Mining Co. and was a pioneer in the concentration of ores by the flotation process. He joined the Consolidated Mining and Smelting Co. of Canada, Trail, B.C. in 1917, becoming vice-president and general manager in 1935. He is the immediate past president of the Canadian Institute of Mining and Metallurgy. His honours include the McCharles award of the University of Toronto, the Leonard and Julian C. Smith Medals of the Engineering Institute of Canada and the Blaylock Medal of the Canadian Institute of Mining and Metallurgy. He has received the honorary degree of LL.D. from Queen's University.

Mr. Thomas E. Purcell was born in Rochester, N.Y. and educated in Buffalo. His career has been with the General Electric Co., the Dwight P. Robinson Co., the Duquesne Light Co. and the Allegheny County Steam Heating Co. He is now General Superintendent of power stations of the Duquesne Light Company at Pittsburgh, Pa. He has served on numerous professional society committees and is presently a vice-president of A.S.M.E.

Mr. Walter W. Tangeman is a graduate in mechanical engineering from the University of Cincinnati. He is past president of the National Machine Tool Builders' Association, and chairman of the Machine Tool Committee of the American Ordnance Association. He is a member of A.S.M.E., a member of the National Industrial Reserve Review Committee of the Munitions Board, and president of the Research Foundation of the University of Cincinnati. Mr. Tangeman is vice-president and general manager of the Cincinnati Milling Machine Co. of Cincinnati, Ohio.

To introduce this subject, "Management—a Trusteeship" it might be well if we go back a little into the history of industry. At the time of the industrial revolution, industry consisted of a series of small manufacturing shops conducted in the homes. The use of mechanical power and machine tools made possible the displacement of these small home industries by the large corporation. That displacement took place, the corporation having found a way to serve the public to an extent that was a great improvement on the services rendered by the small industries.

In those days a main factor in developing industry was capital. Without capital it was not possible to organize industry. The public developed also the concept of limited liability for these corporations which reduced the risk for the owner, which risk he might not otherwise have taken. The soil and climate were admirable for the growth of these corporations and they did and still are rendering a great public service and have flourished.

In the meantime their growth has generated new problems. In the first place the growth of these corporations has required so much capital that it was beyond the possibility of any one, or even a few individuals, to supply that wealth. We find today that these corporations are owned by varying numbers of shareholders or stock holders, in some instances so numerous that it is no longer possible for them to act in concert.

The consequence has been that unified action in the large corporations is now taken by the managers.

the men who are elected or appointed by a board of directors, which in turn is elected by the shareholders. It has become possible in the case of very larg corporations, for these managements to perpetuate themselves in power. I don't say this in any sense that it is a good thing or a bad thing but I do say that it has become possible and that they do perpetuate themselves in power.

That is perhaps enough as far as background is concerned. The method of conducting this discussion is to go through a list of prepared questoins. I will submit these questions to the various members of the Panel and each will comment on each question in turn and then they will discuss generally that question until the clock tells us it is time to move on to the next question. Meanwhile we ask you, the audience, to participate in this discussion by writing down questions as they occur to you.

The first of the prepared questions,—and I will ask Mr. Anson to be the first member of the Panel to give an answer—is as follows: The trend in industry is for the managers to replace the owners as the group in real authority. From the viewpoint of the economy as a whole is this a good thing or a bad thing?

C. M. Anson—Well, Mr. Chairman, whether or not it is a good thing or a bad thing, it is true that management or something of that nature is the only thing in the light of our present day economy. The owners, as they exist today in most corporations, could not possibly function as management, because that ownership is spread usually over a very large group of persons, and so the authority must be delegated to some other body. Management, as it is constituted today, is a natural evolution, and until at least we find something better to take its place, in my opinion, it is the only thing.

R. W. Diamond—I consider that this trend is a good thing from the viewpoint of the economy as a whole, as well as from that of the individual industry. Ability, interest, initiative, and the other qualities required in management for the proper conduct of an industry are not necessarily handed down from generation to generation, nor from owner to owner. On the other hand, the selection and control of managers to insure proper conduct of an industry, can and should be most effective.

There are of course, many exceptions, particularly among the smaller industries, where direct owner control is splendid, and preferable to so-called manager control. This is, of course, particularly true during the first generation or during what might be called the "entrepreneur" stage. While these arguments refer primarily to the well-being of the individual industry, there can be no doubt but that the betterment of the part or of the individual industry means the betterment of the economy as a whole.

T. E. Purcell—Mr. Chairman, I think management speaks for itself. I think it has done such an excellent job of making this North

Photo by Harris & Ewing, Washington
Dr. J. M. Juran

American continent the finest place in the world to live. The more recent achievement of industry in helping so greatly to win the war for us, leaves me with the opinion that there is no question whatsoever how industry should be operated on this continent. Of course there are small industries where the owner is the operator, and in many cases he does a fine job, but we just can't have the standard of living we have and do the things we want to do, if we have to depend on small industries. When we get an industry that has grown beyond the scope and knowledge of one man and it is still being handled by that one man, then this type of management that we are discussing comes into play. My answer is positively "Yes" to your question.

W. W. Tangeman—I think I would have to agree that not only is this trend inevitable, but all for the good of the economy. I cannot go along with the idea that management will become self-perpetuating. One thing is sure: competition keeps management on its toes and makes it effective. I also believe that "management", as it has come into being, has by the very nature of its training and experience a broad viewpoint. It should therefore be able to serve more sections of our economy than many owner-managers (not all by any means) who started in business as the result of an invention, or a merchandising idea, and developed it for personal satisfaction or profit. Corporate growth and the passage of time makes elected or appointed management unavoidable. I think we will see more of it.

Dr. Juran—It seems to be the consensus that for a well-planned economy as a whole, management is a good thing and managers as a group are seemingly worthy of authority. They are perhaps chosen for efficiency rather than for wealth, and therefore they possess a greater skill to keep industry going. Would anybody care to comment further?

Mr. Purcell—I think the manager does perpetuate himself. One indication that we don't always get good managers by that process is the realization that many, many of our small businesses fail due to poor management—those businesses that have been started by an individual and managed by him or his relatives. I think the records have confirmed that management by so-called hired managers is very much better in that respect.

Dr. Juran—I am not sure it is important in this discussion, but there are a number of instances where it has been a difficult task to try to dislodge the so-called hired managers.

The second question on the prepared list is: Whose interests should the managers have at heart in the event of a conflict of interests between some of the conflicting groups (owners, employees, customers, etc.)?

Let me elaborate on that briefly. There are various forces competing with each other for the fruits produced by the corporation. Our subject is "Management—a Trusteeship." This raises a question: Whose interests shall the managers have at heart in case of conflict? We are in effect saying: If there is latitude, in which way should the manager lean; to benefit the owners, the employees or the customers? Mr. Diamond?

American Panel Members

T. E. Purcell

W. W. Tangeman

The National Management Council was represented by executives from the public utility field and the machine tool industry.

Mr. Purcell is general superintendent of power stations for the Duquesne Light Company, and general superintendent, Allegheny County Steam Heating Company of Pittsburgh.

Mr. Tangeman is vice-president and general manager of the Cincinnati Milling Machine Co.

Mr. Diamond—Basically or ideally there should be no conflict of interests between owners, employees, customers and other groups concerned. It is, of course, the manager's duty to do everything possible at all times to maintain harmony and to reconcile differences, bearing in mind the proper interests of all concerned. However, differences do and will continue to arise because of opinions or interpretations of the nature of the respective interests.

These differences often present problems that are most difficult to solve, and it is at such times that the manager is called upon to show his true stature. It is such problems that call for the proper coordination of an open mind, good judgment, good humour, fairness and firmness. If, after doing his utmost to reconcile the differences, he fails, his primary responsibility is then to guard the owners' proper interests, at the same time maintaining a position with respect to the interests of all others concerned, that he can justify and defend.

Mr. Purcell—I don't want to repeat, but it seems to me one of the things here that this question anticipates is that there will exist situations wherein there is opposition between these groups, the owners, labour, the customers and the general public. The manager's job is not to get himself into that fix, to start with, but if for some reason beyond his control he does get into a situation of that kind, it seems to me that he does two things: (1) he applies the golden rule, which is good in every situation; and (2) then he takes steps himself from there on towards the best means of perpetuating the business.

In some cases it may be that he will have to disregard somewhat, the interests of the owners, the public, the customer, or labour, but the primary interest is that he carry on a going concern, and then he allocates the share of the industry to the place where it has to go in order to do a satisfactory job.

Mr. Tangeman—Certainly management's overall responsibility must be for the long term good of the corporation. I have no hesitation in saying that I believe management must strive to make a profit for the owners. I say this because I feel very strongly that nothing of lasting good can come for anyone out of a corporate operation that is not profitable; certainly nothing good can come from it for the employees; certainly no service that is really of value can be given to the customers.

No real service to the community can be rendered by a profitless corporate operation, and I feel strongly that corporations have a responsibility to the community in which they operate. Management's job is, therefore, to see that all of the elements in the operation of the business—the customer, the employee, the shareholder, and the community—are treated fairly and honestly.

These objectives over the long pull all require that there be a profit from operations, because if there is not, the operation ceases, the corporation goes out of existence and everybody suffers.

Mr. Anson—I see no reason to tell any other story now, than the story I have been trying to tell the Unions with which I deal and have dealt for the past 12 years. My contention is to them as it is to you, that there cannot be any conflict of interest, particularly between owners and employees, and I think it is quite logical to say, also, with the customers. When I say there can be no conflict of interests, I say that what the owner wants is a successfully run business, one run so that its future can be assured, insofar as it may be possible to do so, and one where there may be profits, out of which he can get some share. The employee's interest is exactly the same. He wants a well-run business whose future is assured so that his job is assured, and so that he can get from the industry the wherewithal to live.

The customer's interest is also that the industry should be successful, because only a successful industry can produce goods of requisite quality and at a price low enough to interest the public, the community at large. If the industry is run with the utmost efficiency, then the only conflict that can be, arises when the time comes to divide what I usually refer to as "the spoils." Then there might be a conflict of interests between the owners, labour and the customers and it is the Manager's job then, and I think he is quite capable of doing it, to see that all those interests are properly considered and that each one gets his fair share of what results from the business.

Dr. Juran—We seem to be rather unanimous on that score. I like what Mr. Tangeman said about profit. The deep thinkers in the organized labour movement have intimated on many occasions that no crime could be greater than for a corporation to operate without profit. Our Panel seems to have a unanimous realization that the interest of the manager is not confined to any one of these groups, but rather to the long-range life and health of the corporation itself, and to insure that long life and health it is necessary to resist undue pressure on the part of any of these groups.

Mr. Purcell—I would like to say a word on the profit situation. I don't know exactly what it is in Canada, but in the United States it seems in the past few years that it has become somewhat of a crime to make a profit out of the business. There I would say, perhaps, management has not been sufficiently forward-speaking in emphasizing this thing that we are talking about at this moment, that the successful business has to make a profit. There is no other way to do it. But I would like to point out that unfortunately we have not done enough to impress on the public that this is a necessary part of a going concern.

Dr. Juran—I am sure, Mr. Purcell, that is nothing to be ashamed of. On the contrary, if there is a lack of profits the company dries up, the invested capital dries up, and this condition drives away those who might be investors. It might be well to sound a word of caution. We agree that profit is essential. I think we also agree that if the profit in itself is not sufficient the corporation may die, even if it does make a profit, or the corporation may become sick if it fails in its personnel relations or in its relations with its customers, and those groups have been able to cripple a profit-making corporation. We might well go back to the history of the corporation. The justification for its arising in the first place was to give a better service to the public. That is the whole basis of its having risen. If the corporation fails in that, the public will just as surely extinguish it.

The next question is: Is it consistent for a manager appointed by the owners' board of directors to be able to balance the interests of owners, labour, the customers and the general public?

The stinger in that question is the contention on the part of labour, for example, that if the managers are appointed by a body which is itself selected by the owners, it is a mockery for the managers to claim they are trustees. Are they in a position to call themselves referees when, in fact, they are playing on one of the competing teams? Would you start that discussion, Mr. Purcell?

Mr. Purcell—I would start by referring back to the question: Is it consistent for the manager to be able to balance the interests of owners, labour, customers and the general public? I would like to change the word "balance" to "reconcile". Is it consistent for the manager to reconcile these various factors? It seems to me that is what his job is. That is what he has done and that is why we have done so well. The job of management is to run a successful business. For a business to be successful it has to provide good wages and good working conditions. It must provide a product which is needed and useful and at a price which is attractive to the public; and it has to pay a profit to the owners; and having done that, I think it has accomplished its purpose, and it has reconciled the interests of the groups concerned.

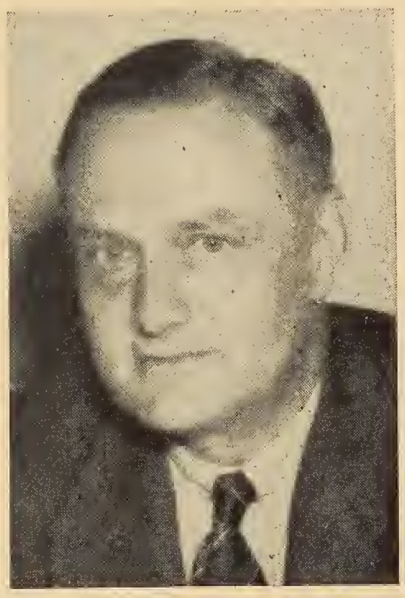
Mr. Tangeman—It is quite possible that management has failed to point out to its people and the public just what the real interests are of the various groups: owners, employees, customers, and the general public. I firmly believe that if they all knew exactly how interrelated and interdependent their interests are, fewer so-called conflicts would exist. There may be times when any one of these groups may feel that management does things that should not have been done; possibly some shareholder may feel that the plant and equipment and working conditions are maintained on a little higher level than absolutely necessary. His management undoubtedly has sound business reasons, as well as employee interest in maintaining plant and equipment.

The same may be said of many other business policies. An educational programme is probably needed to let all groups know just what the objectives are and how the policies of management endeavour to correlate the interests of all.

Dr. Juran—I think we are not really on the point in the discussion so far on this question. Let's put it on a different plane, perhaps. In many games of sport we have a referee. There is no debate if somebody challenges a referee on the basis that he is a member of one of the teams. We do not permit that. The accusations are levelled at the manager that he derives his

Canadian Panel Members

R. W. Diamond



C. M. Anson

It would be difficult to find two Canadians better qualified than Mr. Anson and Mr. Diamond to discuss the responsibilities of top management. They are the operating heads of two of Canada's largest mining and processing corporations.

C. M. Anson is general manager of Dominion Steel and Coal Company at Sydney, N.S., and Mr. Diamond is vice-president and general manager of Consolidated Mining and Smelting Company Ltd., at Trail, B.C.

legal authority from the owners, who are one of the competitors for the fruits of industry. Is that comparable to the case of the biased referee? Or does that not have any relation to it? I think that is the point under discussion.

Mr. Anson—I would say, Mr. Chairman, that it is perfectly consistent for a successful manager, appointed by the owners or the board of directors, to be able to balance the interests which we are discussing. He will not be a successful manager unless he does. He will not be able to carry on that business successfully unless the interests of each one of those groups are given the attention they deserve, to which they are entitled. I think history itself answers that question. So many businesses are successfully run, and they are run by managers appointed by owners or boards of directors, and they have balanced the various interests connected with the industry.

Mr. Diamond—Mr. Chairman, I feel that there is only one possible answer to that question. It is in the affirmative. I might go further, and say that it is not only possible for the manager to reconcile these differences, but it is his responsibility to do so. I realize that although it is his responsibility, he cannot always bring about a solution of the difficulties. That may be an extreme statement, and some of you may take exception to it. I cannot quite see that there is any difference in interest. I think the manager, the owners, the employees, are all on the same team, and I believe also that most owners, practically all owners, recognize that their interests are common with those of their employees and their customers and with the public's, and in the selection of a manager they are going to bear that in mind. I reiterate that I cannot see any other answer to that question than an affirmative one.

Dr. Juran—Let me just press that. There are those who argue that there might be a matter of conflict, for example, in dividing up the surplus created by the joint efforts of everyone concerned. Suppose it is to be divided up, and some of the profits to be given out in the nature of lower prices to customers; or higher wages to employees; or greater dividends to the stockholders. Is it not reasonable to think that any one of these groups might object to the disposition of that part of the profits going to other groups, that one group might feel neglected, that it had not been a fair distribution? I would like the Panel to comment on that.

Mr. Anson—Theoretically that might be so but actually—no. The successful manager knows that he cannot possibly lay more stress on one feature than another. If he does, he is going to run into trouble and he must reconcile those differences if they exist, or he is not going to stay there.

Dr. Juran—Does he have to reconcile them to the satisfaction of the owners or to the satisfaction of all the groups.

Mr. Anson—If he does not reconcile them to the satisfaction of the general public he will not sell any goods. If he does not reconcile them to the satisfaction of the employees he will not have good labour relations. Of course if he does not satisfy the owners, he will probably go out.

Mr. Tangeman—It seem to me that management has to do the thing that is right to the best of its ability. After all, that is the final test. Management must temper its own viewpoint by all the help that it can bring to bear on any problem from the owners, the employees, the customers, and the public; but it has to have convictions of its own; and it goes without saying that it must at all times be fair and honest. Top management must have enough people of varying talents and training throughout the organization to draw on. It does not act alone.

The owners may at times feel that dividends should be higher. Current dividends are important, but not the all-important thing. The business must grow and be in existence as a prosperous company for years in the future, making earnings, employing people, and taking its proper place in the community. That, it seems to me, is the real interest of the shareholder, the employee and the customer.

Mr. Purcell—There may be a little implication in that question that some one of these groups, or all of them combined, might be able to do a little better job than management. I certainly think that the manager as a hired man could do a much better job than the owner could possibly do, in a situation such as you mention, as far as the entire group is concerned.

If we endeavour to take recognition of the thoughts of the entire group we get nowhere, because we are right back to the point, to disagreement among the number of interests, in which there is no way to bring them to an agreement. I don't see why it is not consistent for the manager to do the job along the lines Mr. Tangeman speaks of.

Mr. Diamond—I also think, the way the question is stated, that there is a fundamental difference implied. This is not the case. I like to think of the manager as being to some extent a liaison man between the groups concerned, and that when the manager is talking to labour representatives the owners are confident that he will look after their interests with fairness, and when he is talking to the owners, that labour will have confidence in him and feel that he will represent them fairly.

Dr. Juran—It might be in order to comment here on an article published about a year ago by the president of the American Telephone and Telegraph Company, in which in effect he said that in his company, the managers are the proper people to conduct the business, not the owners. One of the paragraphs was:

> "Of course, management is not infallible; but, with its intimate knowledge of all the factors, management is in a better position than anybody else to consider intelligently and act equitably for each of these groups — and in the Bell System there is every incentive for it to wish to do so".

One of the best expressions of opinion on this subject came to me from Mr. Austin S. Igleheart, president of General Foods. He took the view that the manager is faced with every one of these factors: So far as wages and workers are concerned, there is competition among the companies, and a manager must meet that competition. In the case of the prices and the features of services rendered to the public, again the manager is in competition with the managers of other companies. Finally, so far as getting capital is concerned, again the manager is in competition with the other managers for the hire of capital from those who have it. It was Mr. Igleheart's feeling that those competitions themselves do a good job. The extent to which we can lean in one direction or another is thereby sharply reduced.

Mr. Anson—I think possibly a word or two on the interpretation of that word "interests" might be in order. Can the manager reconcile the interests of these three groups? I say yes, he can. History shows he can. If you interpret that word "interests" as "desires," then it becomes a different thing altogether.

Dr. Juran — He helped them make a compromise between what they feel they want and what they can have. I think there is still in the minds of a good many people, an unanswered question,—how can the manager be responsible to one of these competing groups, and yet deal fairly with the interests or desires of all the groups concerned? With all the discussion here, which has been most instructive, I doubt if the question has been answered satisfactorily from the viewpoint of those who raised that question.

Mr. Purcell—It depends upon where the question comes from. Some people never can be answered satisfactorily. Any one of these groups about which we are talking, the owners alone, or the general public, can put management out of its job overnight, almost, because they have the finances behind them. There was one case you mentioned where management did go out of business, for that very reason.

As to the referee situation, I don't think that it is a good example to try to compare management with a referee. It might have been in the good old days of John McGraw, but here we have a different situation. The manager is not a referee at all, as I see it. He is the conductor of the affairs and not a referee. To me there is a vast difference.

Dr. Juran—The ideal is to find some formula by which management could divide the fruits of the combined efforts of all the groups. It is the fruits that seem to be the question here. There is no such formula, and that is what brings up the question we have been previewing here. I don't know whether the manager of today can be compared to the sovereign's judge of the old days. The judge was appointed by the sovereign, but he made decisions as between the sovereign and the public. He was appointed ostensibly because he was a fair man who knew his law and could properly decide among the parties; but in due course that was done away with.

Mr. Anson—Was he not the owners' representative?

Dr. Juran—He was, but today a judge is not appointed that way. He is appointed by those who are responsible to the general public.

Mr. Anson—The manager is appointed by the owners.

Dr. Juran—That's right. My point is that in the one case where we might have found a parallel, the parallel has disappeared. The judge appointed by the "owner" of those days no longer is appointed by that "owner."

Mr. Purcell—It seems to me that we have to differentiate between that sort of situation and the one we have here now. You speak of a formula, which would compromise between the desires and just dues of the several interested parties, the owner, labour, the customer and the public. I think everyone should realize that any such formula as that would have to be one that could be changed almost from day to day. I think, in effect, we have a formula, although it is not down in writing, and that is the good judgment of those people who are in management positions. They have to change their formula from day to day.

They watch the wages of labour; the working conditions; the pension situation; all those things; opportunities for advancement. They spend as much money in that direction as they reasonably can. They watch out for markets and price changes, because that is one of the most important factors in the busines. They watch out for changes in the financial fields, because they have to consider investments. The manager has to know the prices they have to pay for materials and they are constantly changing. I cannot agree, perhaps, with your thought that a formula might be the answer to the question.

Dr. Juran—Neither do I agree with that implied thought. Certainly I don't expect in my time to find such a formula. There is such a formula in Russia, where, incidentally, their rate of profit is probably higher than anywhere else on earth, but certainly there is no formula in our country, and it is very unlikely that any of the groups here will evolve such a formula.

The next of the questions is: "What are the measures of managerial effectiveness?" In trying to elaborate on that can we state in words what is a specification for the manager's job? How do we decide whether the manager is doing an effective job or not?

Mr. Tangeman—I suppose we must agree that, in the final analysis, management's effectiveness can be measured in the relative satisfaction of all parties in the corporation activity, the employees, the customers, the shareholders, and the general public. If these people are satisfied, the management,—at least for the moment, has been satisfactory. However, I come back to the point I tried to make before; namely: how well has the future of the corporation been provided for by management. This would seem to be clearly their responsibility, and something that must be planned to the satisfaction of all groups. Management must take from present earnings the sums necessary to provide for the future success of the business; new developments, new designs, research. All of these have to go forward as current expenses.

Management must keep the corporate property in shape. The latest and most efficient equipment must be installed. Every effort should be made to improve working conditions, to provide a pleasant place to work which will be a credit to the community. These expenditures will pay dividends of all kinds in the future. A forward-looking policy with respect to labour is essential.

All these things add up, or may add up, to a heavy load on current operations; but they are like a premium on an insurance policy. You should try to keep everybody as happy as possible in the present, but the future of the corporation must constantly be borne in mind.

Dr. Juran—Mr. Anson, what are the measures of managerial effectiveness?

Mr. Anson — One might say that the measure of his effectiveness is the measure of financial success enjoyed by the corporation or industry with which he is connected. But if one did answer thus, he would probably have answered without thinking. I believe a study would show that it cannot be the measure of a manager's success. One might take as an example the railways. There have been many years in which those railways have not shown a profit, yet one cannot say on that account that they were not well managed.

Other industries are working, possibly, with marginal raw materials, as compared, perhaps, to similar industries not far away, working on adequate raw materials. The first may show less financial success than the latter but it still may be better managed. The measure of managerial efficiency is very different. In some cases it is easy to say "That industry is well managed", but there are many others where it is not a simple matter to do so.

Investigation in most respects can only reveal whether the industry is efficiently managed. If one were to conduct such an investigation, he would look for many things. First, is the industry concerned supplying the public with an article or service needed? Second, is it carried on with a minimum of friction? Does it have good public relations? Third, has it good labour relations? Fourth, is it static, or is it moving ahead with the times, developing new goods or improved services? Only by a close study of all those ideas and many others, can one arrive at the final decision as to whether or not the industry concerned is or is not effectively managed.

Mr. Diamond—After giving this question some thought during the last day or so, I made a few notes of what seemed like reasonable yardsticks of managerial efficiency. I don't pretend that they cover the entire range. *First,* harmonious relations, with employees, customers, the public, directors and shareholders—with all groups. *Second,* efficiency generally and in the conduct of operations, in the technological field as well as in cost control. *Third,* stability of the industry generally, in the community and in the province or state, present and future. *Fourth,* progressiveness—in research, development and expansion. *Fifth,* perspective in policy fixing and in policy control, (a) in regard to present day problems; (b) for the short term future; (c) for the long term future.

Dr. Juran—We are grateful to you for having taken the time to apply some of your own principles and for having evolved that list.

Mr. Purcell—I agree. I have only one or two minor thoughts to contribute to that. One of the measures of managerial efficiency, as I see it, is the type of organization he has, and that is cut into two categories. One is whether or not an organization as it exists today is capable of carrying on a business as of today and happy in doing so. That is one of the big things—*and happy in doing so.* The other is whether or not the organization is of such a nature that there is always new blood coming along to replace the older men as they retire.

Dr. Juran—That seems an admirable specification of managerial effectiveness, that is, the extent to which these various interests and desires can be reconciled. Mr. Diamond's classification might well be recorded. That is doubtless a very difficult specification for the manager to meet. It fits in with the next question, which is:

> "What are the ways of training the managers of tomorrow? What are the means by which we can find men who have the innate capacity to do a job of that kind; and what are the ways, once we have found men of that capacity, of giving them the necessary supplemental training and experience so that they can make the most of those capacities?"

Mr. Anson—I would like somebody to tell me the answer. I don't think any of us who have to do with the training of the future managers know the full answer to it. Great strides have certainly been made in the past twenty years and more, particularly in the training of young men to take over these positions in the future. But I think no one firm anywhere is satisfied that the acme of perfection has been reached in that respect. As far as I am concerned, and I do speak humbly, about the only way I know of accomplishing this training is to take a young man whom one considers has the requisite educational qualifications, and then put him through the mill.

First you have to pick a man who has the guts to go through with it, and who is not going to be afraid of dirtying his hands, or afraid of hard work or long hours. Then it is your job to see that he is given an opportunity of learning something of every phase of the operations. Ultimately, after that stage has been passed, you must start giving him responsibility, and beyond that, get him into sharing these decisions which make up such a large part of management.

Mr. Diamond—That is a question very close to my heart. I believe that a fairly clean cut programme can be followed. I think you will agree that in past practices there has been a great wastage of human potential, natural ability, and talent. We have not in the past used all of the means available for finding and developing promising men.

To deal with a problem of this kind in any one industry, the first step is to find whatever potential top management material there is in your own industry. The next step is to recruit the best material possible from outside. Then all of these men should be developed and studied and screened continually. Special training courses should be established, with individually designed courses for the exceptional men.

I believe in loading them up with responsibilities, in shifting them from job to job. A man with the proper potential qualifications for top management is likely to be a good man in any job that is given him. In time refresher courses in advanced management schools might be wise. I believe that as the years go by, as an outcome of practices of this kind, the small number of men concerned will loom up so prominently and arrange themselves in such an order that there cannot be any doubt when a selection is to be made.

Dr. Juran: That philosophy is worthy of greater circulation. I might mention in passing that I have to date never encountered anyone who has written a book on "how to find good managers." It is almost amazing.

T. E. Purcell: In my lifetime this has been the biggest problem I have had. Undoubtedly I have spent many, many times the effort on trying to find good men than on any other particular phase of the business I am in.

Basically I go on the belief that every man is entitled to the best kind of job that he can hold down, and the problem is to get him into the best job. Some years back that was not as difficult as it is today. We are now faced, in the United States, at least, in most industries, with a unionized situation wherein seniority governs, and that is making it most difficult, if not almost impossible, to take the young men into working organizations and move them up through, so that they will be in a position to take a supervisory job within any reasonable number of years.

So we have really two problems. One is to screen as well as we can our physical workers, because through the seniority provisions, sooner or later, we may have to pick a man on the basis of seniority for a supervisory job. Then we have the problem of finding and selecting capable men not only in the physical workers' group but also in the engineering and other non-physical workers' group. After selection we put these men through the training course. Then we make every effort to give them an opportunity to learn all of those things which go to make a capable manager.

I believe a man who does not have the backbone and ambition and will-power to learn when he is given the opportunity is probably not going to make a good manager at any time of life. We must give them as much experience as we can; give them training and the opportunity to learn outside of their jobs, and then gradually put more and more responsibility on them, then watch their reaction to such responsibility. It has been this reaction, in my experience, that is the best guide to selections of men for the higher jobs.

One unfortunate thing that occurs in the younger life of a lot of men is, that they do not realize that they are being watched. I don't mean by that, watched to see how much work they do, but rather to see how much progress they are making.

Many things enter into their success. One is their personality, how they react to the people below them, how they handle the men and women who may be working for them; how they react to the people above them. A man may be able to handle well the people working for him but may not be able to get along with the president or the vice-president or the group above him, and I have no answer for that. Today, there are many good jobs in industry awaiting good men. Perhaps the men are available, but at the moment no one has any way of finding them, in my opinion. I think we should try and impress this on some of these young men. Dr. Juran told us that 80 per cent of them want to be managers.

Mr. Tangeman: I think this subject has been well covered. We all want the answer, because this is undoubtedly one of the most important parts of management's job. To perpetuate the corporation and prepare it for the future, calls for the development and training of management personnel on all levels.

Mr. Purcell said these younger men ought to know they are watched. We find it a little difficult to get all of our supervisors to really watch them closely enough and to be sufficiently interested in the men that have real promise. What is everybody's business is frequently nobody's business, and we have found that after you have made the best selection you can, and have planned the best rotation of jobs, it is necessary to put their training and supervision in some one person's hands. Somebody has to be interested in them, to see to it that everyone else who contributes to their training is interested in them. In the lower ranks of management there is a great deal of competition, and training programmes have to take this into consideration. In a busy organization department heads are fully occupied, and sometimes they do not have the time to give to the trainees. Training supervision not only checks up on the trainee, but on those for whom he works.

Dr. Juran—This question is perhaps worthy of another round. It is of the utmost importance. Recently a study has been made by Professor Drucker of Bennington College, of this very problem, under the sponsorship of the General Motors Corporation. He has written a book called "Concept of the Corporation," in which he has identified several of these problems we have been discussing. One of the principal ones touched upon was the problem of the conversion of the specialist into the generalist. Consider a chap who has spent 15 years in the accounting department. He becomes head of one of the branches or departments and runs the risk there of coming to grief because he has developed in the accounting department what has been called a "trained incapacity" for doing anything else. He becomes so solidified in the viewpoint of that one department that he gets less and less able to move elsewhere; that might apply to the chemical laboratory or any other department. A major problem in industry is how to move men from one of those specialized posts into one of the general managerial positions. They should have rotation from one job to another, which not only gives perspective, but is also the basis for understanding better the nature of the managerial process. The foreman who gets the view that he is a good foreman only if he can operate any of the machines better than any of the men in his department has missed the point.

Rotation — what does it mean? It is one form of training school for management. Another one is being tried in some companies, the so-called "Junior Boards of Directors" in which the young men have the opportunity to meet as a group and discuss problems outside of their own organization as well as inside. This is in the experimental stage. There are still other devices for training and for measuring capacities, such as assignment to staff departments. Then there is career planning. Among the companies who are doing this type of work Standard Oil is outstanding as an example. The military services have a so-called career planning in the case of picked men. The organization undertakes to plan for them to deliberately spend so many years in this department and so many in that one.

Those are some of the devices being tried. It is heartening to see discussion and experiments carried on and this recognition of a need to make headway in a difficult problem. Are there any further comments?

Mr. Diamond—I may be too optimistic, but I would like to refer to what I said before about the great waste of potential talent. I was impressed by Dr. Gilbreth's address at noon today. She referred to the early days of management engineering. It was not an easy thing then to realize the changes that were taking place. We must bear that in mind, and apply it to the problem that we are discussing. Have not the methods we have used in looking for men of outstanding talents been extremely haphazard in the past?

Certainly there has been no orderly approach. Consequently it does seem to me that if these problems of finding people for the multiplying jobs of responsibility in this more complex world are to be solved, we must approach them in an orderly way. I, for one, believe that that will become imperative. I believe that there is plenty of talent to meet the needs of the day and of the future, if we will but go and find it and then make the most of it.

Mr. Purcell—I would like to go on record as favouring the extension of this career planning. In my opinion we should look on every man on our payroll as being potential executive material.

Dr. Juran—I want to be sure I have not misstated Standard Oil Company's practice. The career planning is based upon men who have been selected, who have already been with the company enough years, and have received the scrutiny of enough people, including the officials, that they are identified as men of unusual promise. Only when they have become so identified can they become eligible for this so-called career training or planning. Perhaps that has not been completely understood.

The next question is: "Should management become a recognized profession?" That calls for some explanation. If we go back 100 or 200 years, we find that some of those who were in professions that today enjoy some measure of public trust, were rather haphazardly selected. The doctors of 100 years ago and the lawyers of 200 years ago became doctors and lawyers, not because they attended law or medical schools and passed examinations, but rather because they were employed by doctors and lawyers and served their apprenticeship, if you wish, and upon the recommendation of their superiors became members of the profession.

Management today is very young as an activity, and the need for management as an activity is itself very recent. In a measure it has always existed, but the complexity of problems as they exist today are of recent origin. If we want to paraphrase our question, which I repeat: Should Management become a recognized profession?—we might first state what we mean by a profession. When we examine the nature of the professions, we find that all of them have certain things in common. First of all they serve an indispensable public need. Secondly, they require a selection of men who must meet the character and fitness requirements. They require a certain minimum of pre-professional training, not only in the professional work itself, but in cultural matters as well. That is number three. Fourth, they are required to assimilate the specialized knowledge of the profession. Fifth, there is an examination and a license procedure. There is a responsibility to the public. No one may practice without having been certified, for the protection of the public. Finally, they must agree to abide by some code of conduct or ethics. Those are the attributes of recognized professions.

Mr. Diamond—I am afraid that the problems of management are so different from those of the so-called professions, that it is undesirable that management should be looked upon as a profession. There are, of course, many fine features of the professional idea that should be and are, adopted by management naturally. The normal job of management is so different from the professions, and is so difficult to define, that it is in a different sphere altogether. We must recognize that one of its main functions is to rationalize and co-ordinate many intangibles.

Mr. Purcell—My answer is emphatically no. I have many reasons. I look upon the job of a manager as being entirely different from the job of a lawyer or doctor. I suppose that one doctor can determine whether a child has measles as well as another. The symptoms are more or less common. So on, down the line. We have professional engineers' associations in the United States, as you have in this country. The mere fact that a man carries a license to do something is no indication to me at all of his ability to do so.

The problem of management is to consider many tangible and intangible items, and to come to a decision. I think it is more of an art than a profession. Certainly one thing that would happen if a manager had to obtain a license is, that we would have on our backs all the politicians in the country.

Down our way we have boards who grant licenses to engineers, and I know many engineers with licenses who are not engineers in the sense in which I like to think about them. I think management is on a much higher plane than a profession. I think it would be a step backard if management were declared a profession and had to have all these things.

Dr. Juran—On behalf of the medical and the legal professions, I might well point out that as a result of their licensing procedure it has been possible to stamp out unlicensed practitioners. It is possible today for one of us who is sick to telephone a man of whom he has never heard, but who represents himself as a licensed doctor, certified by the profession. The amount of risk he takes in putting himself in that doctor's hands is small indeed.

Of course the moment you have a licensing procedure for the profession you have a monopoly on an indispensable need. The opportunity for abuse is obvious. That is not the question we are discussing here. Neither is there any suggestion that we should be in the position, when we need a manager, too, to look up a list of managers in the telephone directory and secure him then and there.

Mr. Purcell—I had no thought of belittling either the medical or legal profession.

Mr. Tangeman—Isn't it a fact that a man is a manager whether he has two persons working for him or a thousand? There are managers all through organization. In fact, they are management organization. Are they all professional men? Are they going to be Grade A managers, Grade B managers, or Grade C managers? You could not apply such a classification to doctors. Hadn't we better forget about adding the professional title to the manager's job?

Mr. Anson—When one decides to become a lawyer or a doctor and passes his examinations, he automatically becomes a member of one of these professional groups. He goes through certain years of education followed by, in some cases, practice for one or two years in a comparatively minor sort of way, such as an internship, and then he is licensed to practise that profession.

I don't think for one moment that anyone is suggesting that a man should study for four, five or six years, devote two or three more years to a sort of internship in some industry, and then become eligible for a license to become a manager. Anybody who hopes to get into a managerial position is going to go through a much sterner apprenticeship than that, and I suppose 80 or 90 per cent of them fall by the wayside.

Dr. Juran—Our next question is: "To what extent should labour participate in management?" I am going to combine that with the next one: "What is to be the final boundary line between management's 'right to manage' and labour's 'rights in the job?'" I can think of no better way of explaining what is meant by such a question than to read something I clipped out of a newspaper in Montreal yesterday. It is datelined Asbestos, Quebec, May 12th. The pertinent part reads:

> "Lewis H. Brown, chairman of the board of Canadian Johns-Manville Co. Ltd., declared in a report published Wednesday that

the real issue in the asbestos mines strike 'is not wages and working conditions' but union demands 'to take over management rights.' The company's mill and factory here comprise one of five asbestos operations idle since Feb. 13th, when 5,000 members of the Federation of Asbestos Syndicates went on strike.

"Mr. Brown said demands of the Syndicate would provide that promotions be approved by the Syndicate; disciplinary action by management be approved by the Syndicate; no incentive be installed on any job unless approved by the Syndicate; no changes be made in job methods or rates unless approved by the Syndicate."

That is the pertinent portion of this article. The question now deals with labour's rights to participate in management, and the final boundary line between management's right to manage, and labour's rights in the job. Is labour's so-called right-in-the-job in the nature of an invasion into logical management prerogatives? Or is the issue rather one of mutual rights? What is the status of the change that is taking place between the so-called rights of labour and those of management?

Mr. Purcell—For me this is a simple question to answer. I think the article just read is the answer to the question, and that is that if labour should get into management they would manage just by threat of strike and violence — and there we are. I doubt very much that labour has progressed to the point where it can logically think about becoming a partner with management.

The answer to the question "What is to be the final boundary line between management's 'right to manage' and labour's 'rights in the job'" is also an easy one. I think they are entirely separate. I think management should manage and labour should have nothing to do with it. As to the things that labour wants, or labour's rights in the job, I think every man has a right to a job. I think sometimes, depending on the type of business the company is in, that he has earned a right to his job.

Dr. Juran—Mr. Tangeman is that rare creature, an official who has no union in his plant. Will you comment?

Mr. Tangeman—"Rights to manage" and "rights in the job" certainly do not exist without equivalent responsibilities. There are responsibilities that go with management, and one of the responsibilities certainly is to see that everything possible is done to provide satisfactory jobs in the enterprise. There are responsibilities in every one of these jobs, to do the best possible work with what management has provided. Aren't we a little prone to get things mixed up? "rights" carry responsibilities, and "responsibilities" provide rights.

I had an interesting experience last summer in France. In looking over some property we discovered a peculiar situation. The company which had used the building before and during the war had been engaged in the manufacture of cars and repairs to diesel engines and locomotives. Work for the Germans during the occupation brought the company into disrepute, and the property was confiscated, the organization disintegrated. There were 20 to 25 men left, all good mechanics, willing to work but unable to because they were not organized to get business, or to supervise their efforts. They hunted up one of the men who had been a foreman, and also an engineer who had survived the purge. They said, "For the time being the State will let us use the building and equipment; but we cannot work unless we have somebody to get us work and tell us what to do."

For one and a half years these two men, who had the *experience* and *knowledge*, kept them going as their managers. The men believed that they were persons they could trust to manage their labour—they had earned their confidence. I think the same thing could happen in almost any enterprise if the same test were put to it.

Dr. Juran—We are all charmed with that story. Any man who could face a test of that kind, in an election on the part of employees as to who should be manager, and survive the test, would certainly merit congratulations.

Mr. Anson—"To what extent should labour participate in management?" I suppose you could answer that simply by saying,—not at all. But over the years a lot of water has gone over the dam, and we have no doubt learned a lot of things. We must face the fact that labour does participate in management, but to what extent it is rather difficult to determine. Through their negotiations with management today they are setting certain boundaries beyond which management cannot go. I am inclined to think that as time goes on they will participate more and more.

One must not say that they should not participate any further because of the type of some union managements that we have today; I mean union leadership; even there the situation is changing, particularly on this side of the water. We are relatively new in dealing with unions. Unions are new. They are still in their growing-pains-stage. Yet even in the short period of ten years the approach by the unions to the problems in industry has changed considerably, and I think has made remarkable progress, and I think they have contributed something to it.

There is one instance I have in mind, where the union wanted to put in some clauses restricting management's right to fire men. We fought it. I was dead against it, and finally we came to an agreement on the clause, with certain restrictions. Those restrictions were: Under normal circumstances a man guilty of a first offence would be warned; for a second offence he would be laid off for a week; and for a third offence he was to be discharged automatically. That did not take into consideration the few isolated cases of theft or bodily harm or such cases, but it did cover the bulk of grievances which come up. We find it is working very successfully, and are satisfied that we gave in, to that extent.

So I cannot say to what extent labour should participate. All I can say is that they are participating more today than a few years ago. I shall be more and more surprised if they don't participate more and more. I think good management has to adapt itself to this.

Mr. Diamond — I think those words "management" and "participation" need to be qualified for me to deal with them as I would like to. "Management" has a different interpretation in different industries. Sometimes it is the policy to attribute that term to men of a very low supervisory level. In other cases it is reserved for men in the higher levels. I assume that in this case you refer to top management or at least the higher levels.

In regard to the word "participation", one has to know whether you mean actual participation in responsibility. I agree with Mr. Anson that there is participation by labour in management today, and there should be, but that is just participation in some of the problems, without labour taking any of the responsibility. However, good management should always take full advantage of consultation with labour, and labour should at all times feel free to advise or constructively criticize.

Dr. Juran—In order to give the questioners in the audience an opportunity to have their questions discussed, I will now ask Professor Coote to bring them up.

Mr. Purcell—May I just say first that I assumed we meant responsible participation at the board of directors level or its equivalent. I was not thinking at all in the remarks that I made of practical participation. They do limit management, of course. Wages are set and grievance procedures established. When a man is discharged the union has something to say about whether he should be brought back or not. The thing I was speaking about was, as Mr. Diamond put it, participation in policy making at the higher levels of the company, where the responsibility for those policies has to be assumed.

Dr. Juran — So far as labour's place in the job is concerned it might be useful to go back a good many hundreds of years and consider conditions under what was known as the feudal system. A man at the bottom of that society, a farmer-serf, had no rights whatever in land. He had the right—it was called "tenancy at sufferance"—to remain there until such time as he was thrown off; but over the centuries he acquired more and more rights until today he is absolute owner of the land. Yet, in those early days, the idea of ownership of property as real estate did not exist. There evolved over the centuries a new type of property.

In the early days of our industrial society, a man holding a job, a piece of industrial territory, also had the slender right to remain there until he was asked to move. Over the years and particularly in the last couple of decades, he has greatly increased those rights. Today, for example, in the case of the civil service, employees of all the large countries, it is not legally possible to put the man off a job that comes close to job ownership. Yet, in the beginnings of industry, there were no rights in the job at all.

May we now take up these questions as they have been written by people in the audience. First: "In this panel discussion does management include the directors?"

Mr. Diamond—I consider only the chief executive officers are included in that term. They constitute the top management level.

Mr. Anson—My opinion is the same.

Dr. Juran—The second question is: "Conflicts can arise when management plans a scarcity in order to continue making a profit. If so, what then? Can this be in the interest of workers or the general public?" With that one we might combine another: "Where should making a profit end and gouging the public begin I have in mind monopolies, cartels, etc., the dairy industry being one example." May I ask for comments from anybody? (No comment)

In the absence of the man who wrote those questions, let me press the point. I take it that nobody on the panel would consider those things good management, but the question indicates that those things are being done. What is the answer in terms of all the things we talk about?

Mr. Anson—We are not pretending that all management is good.

Mr. Tangeman—Probably there have been instances where production has been curtailed in order to maintain prices, although I know of no specific case. However, such procedure would seem to indicate bad judgment on the part of management — wouldn't the board of directors, if they had been alive to such a situation, have disapproved, because in a highly competitive economy, it is not possible for long to gain any advantage by the process indicated.

Dr. Juran—It might be necessary to make this point. At the moment there appears to be no way in which managers as a class can hold down the excesses of some of their members. The excesses are deplored by the so-called good managers. Because of this, all managers are running a risk of a serious public reaction. We do not have to go back very far to recall an instance of certain financiers undertaking certain questionable dealings, with the result that the public suffered greatly thereby. The consequence was that the reaction of the public fell not only on the financiers who sinned, but upon a good many who had not sinned. In my humble opinion this is one of the biggest problems facing managers today, plus the fact that while there is available a reasonable extent of knowledge of what is excessive and what is not excessive practice, the managers as a group are not doing a great deal about suppressing or eliminating excessive practices where they exist.

Each "good" manager is in a sense tainted by each of the unscrupulous managers, and unhappily the unscrupulous ones are the ones who gain the headlines. Their occupation certainly ties them all together by some invisible cord.

Mr. Purcell—We have a bill before Congress now which will reinforce administration's hand on the very thing we are talking about, telling everyone what they can make and how many items they can make, and through that method setting a price. It is not so long ago that we were ploughing under wheat and killing little pigs, and even today in the United States it is pretty hard to buy a No. 1 potato, because our good government buys all the No. 1 potatoes and scraps them, and we have to eat second grade, and they consider that necessary to keep the prices up. That has not so much to do with industry as it has with governmental regulations.

Dr. Juran—The next question is: "Should not the manager give more attention to personnel administration at the supervisory level, as a means of developing managerial talent?"

Mr. Diamond — I think that question is extremely opportune, and my belief is that through the supervisory personnel structure industry must sell itself to the hourly rate man, because the hourly rate man looks upon his immediate boss as representing his employer. Unless industry conducts itself in such a way as to sell itself to all supervisory personnel, how can it ever hope to sell itself to the individual worker?

Mr. Anson—That is being done today to a greater extent than ever before, and more and more will be done as the days go by.

Mr. Purcell—It has always seemed to me that one of the toughest jobs in industry is that of being a foreman. For that reason a great many people I know, including our own company, spend a greater effort in assisting the foremen than they do in any other individual category in our supervisory organization. I think this is where we can make or break ourselves, and I don't know what is meant by "more attention" but I certainly think management should put a lot of effort into that field.

Dr. Juran—The next question is: "What is management's point of view of profit sharing in an organization? Would it help overcome the difficulty of bringing chosen men up through the organization quickly?"

Mr. Purcell—I don't believe in bringing men forward quickly. As to whether or not we should have profit sharing. I should dislike very much to get into a discussion of that this afternoon, because there are so many points to it that we could sit here and talk about it from now until midnight. It has worked in some places and not in others. It has been my experience with profit sharing that it is fine when there are profits to share, but just the opposite when there were no profits to share.

Dr. Juran—I think one of our panel members has profit sharing. Perhaps he will comment on this?

Mr. Tangeman—We have had it in one form or another for some time and are constantly striving to improve our plan. There is a tremendous amount of education that must go on, because as Mr. Purcell said, everybody is happy on the way up, but not so happy on the way down. Education in the fundamentals of economics, and experience with any plan should simplify its acceptance. Extra remuneration based on results obtained provides a simple incentive which, if it can be made to work, should solve many remuneration problems. We call our distribution a "Performance Dividend" and the amount varies with the net earnings left after the regular dividends and allocations for plant betterment—it is not limited to management. It seems to me ultimately we are all going to have some scheme of this sort, if we are to build up the sense of responsibility and loyalty in an enterprise which is so important to its success.

Mr. Anson—Far more industries than you might think use the profit sharing system. Any company that uses a production bonus system of any kind is in effect sharing the profits. It is asking an employee to produce more. It is the same as saying: "If you produce more we will give you more pay."

Dr. Juran—The next question is: "Corporation pension schemes do provide the employee with some degree of security, but also remove the employee in some degree from a competitive labour market." What is the Panel's view of this problem?

Mr. Tangeman—I think I understand what is meant. A pension plan has the effect of stabilizing employment, especially after some years of service.

Dr. Juran—I am sure that is what is meant. It gives him a tremendous stimulus for remaining, and it takes him out of the labour market. I think the point of the question is—what is the balance provided there? The providing of security on the one hand forces these employees to remain out of the labour market.

Mr. Tangeman—I do not think that any young person would be forced out of the labour market by a retirement plan. In our free countries, people have a choice as to what they want to do — a precious heritage that must be preserved. However, with the growing trend for older persons to step out of industry, the expectation of some retirement income as a supplement to current savings, certainly must provide real satisfaction.

Mr. Purcell—It is my experience that the pension system has acted to restrict men from changing places of employment when otherwise it would be to their advantage. Our experience is that younger men pay no attention to the pension plan, but come back and forth as they see fit, and if they get a couple of hundred dollars out of the pension plan when they quit they are delighted, because they can buy something with it; a radio or a television set, or make a payment on a car. Many of us have expressed the hope that we will see the day that a man will not suffer the loss of his pension when he leaves a job for a good, legitimate reason. How that can ever be worked out I don't know. But I think it is some handicap, and that over the years we will find a way to lick that. When a man goes from one job to another his pension should go along with him.

Mr. Anson—I am entirely in favor of a pension plan. The benefits derived far outweigh any possible disadvantages.

Dr. Juran—I might make this comment. Two months ago one of the demands made by the automobile unions in Detroit was that pension plans be amended, so that if a man did move from one company to another he would not lose his pension. Mr. Purcell raises the question: Is there a way that this can be done? I had to become a professor to find the answer to that one. I had spent many years in industry, and became a professor only a few years ago. In the case of most of the universities in the United States, a professor's pension status is not disturbed, even if he moves from one employer to another. If a man has an appointment at the University of Michigan, for example, and decides he wants to better himself by taking a position at the University of Southern California, it makes no disturbance in his pension situation. The reason lies in the fact that there is a so-called Teachers' Insurance and Annuity Association. It is a super-insurance company which receives these monies and which keeps these funds, so that no matter which school makes the contributions they are credited to that man, and no matter from what school the man makes his contribution, the money is also credited to him.

It is entirely feasible for a number of industries to get together and, through one of the insurance companies, develop a set up of that kind. Not long ago I was discussing this with a number of American production officials, and we got into this very question. We were quite unanimous in the feeling that this thing must come, and that if industry does not do it, then, as usual, the government will step in and do it for them. In the case of the universities in the United States, it exists and it works.

Ladies and gentlemen, we have had a most interesting afternoon. To the extent that I can judge your interest, it seems to have been enjoyed by everyone. Certainly we are very grateful to the members of our Panel, and certainly to Professor Coote for his good services in editing the questions from the floor.

The meeting is adjourned.

The Problem of Training Commercial Employees in Brazil

Management's Approach

Prepared by
H. Beck, Jr., *Vice-Director.*
1st Division, I.D.O.R.T.

Presented by
M. E. Alvaro, *President, I.D.O.R.T.*

Mr. E. B. Jubien presided at this session held on Saturday morning, May 14th.

Mr. Beck's paper in its details applied to conditions in his own country and it is expected that it will be published in full in his own language. It has therefore been published in the *Journal* in abstract only.

Dr. Alvaro's introductory remarks included interesting information about the formation and activities of I.D.O.R.T., and this portion of his address has been included in its entirety.

Mr. Chairman, ladies and gentlemen.

Our Institute was founded in 1931 as a result of the depression which was hitting our country hardest at that time. Some people there decided that the best thing to combat that depression would be to improve efficiency, and on a certain date in 1931 ninety-two people from the City of Sao Paulo got together to establish this Institute. They decided then that when the membership of this Institute should reach 500 they would be satified. I am pleased to say that our membership to date is 28,000 plus, so we did go beyond our first goal.

We started our Institute in two divisions. The first deals with the study and application of administrative organization of firms, societies, departments, etc., studying co-ordination of the principles of standardization, buying and selling, production, etc. The second division deals with the human element and its environment, analyzing different functions and individuals, professional guidance, professional selection, training, psychology of work, hygiene of work and industrial hygiene.

One of our first assignments was given us by one of our administrations, that decided our bureaucracy was getting too bureaucratic, so it was a kind of "Hoover" Commission we were in, and a survey was made by government agencies as to what they should do, and a plan was made for improving their efficiency. This has been implemented to a large extent but unfortunately, as we all know, one administration does not necessarily carry on what the previous one has started, so much of the things we established have been changed, and I don't know if they were changed for the better.

Two Divisions

Other activities of our Institute are to give courses every year. We hold one elementary course on scientific management for the young men who are working with firms; those who want to improve themselves so they can reach for higher positions. We have a more specialized course for those who have completed the first one. Out of these courses, which we have been holding for the last seven or eight years, we have developed an alumni association, which meets under the supervision of the directors of these two Divisions, and they have seminar meetings and make studies of surveys of their own. We feel that these alumni are really a group of people on whom we can count in the future to carry on with the work of our Institute, which is pioneering work, meant to sell the idea of efficiency in our country.

This paper, prepared by Mr. H. Beck, Jr., vice-director, 1st Division, I.D.O.R.T., the title of which is "Management Approach to the Problem of Training Commercial Employees in Brazil" deals with the agency called, in Portuguese, "Servico Nacional de Aprendizagem Comercial" which has been abbreviated to S.E.N.A.C., and is known as such in our country.

Brazilian Conference

At the close of World War II, representatives of Brazil's industry, agriculture and commerce held a conference at Teresopolis, the basic objectives of which were to increase national income, to develop economic forces, to foster economic democracy and social justice, and to raise the standard of living. Recommendations included provision for free pre-vocational courses and technical education for children under the employment age, and the placing of responsibility to provide such education in the hands of the National Association of Manufacturers and the National Chamber of Commerce. The latter was directed to create and organize S.E.N.A.C., which would also be charged with the direction of employer-employee relations.

In the State of Sao Paulo, with population of 7,500,000 in which is concentrated over half of Brazil's industry, there are 32,000 firms with close to 100,000 employees, four-fifths of whom are of age and one-fifth minors. Brazil, with population of 43 millions, has 400 commercial schools, all privately owned, with some 80,000 students. Only 7 out of every 1,000 get secondary schooling. In normal times, workers' salaries do not permit children to get full tuition in private schools, so most of them are put to work after completing their primary education.

Schooling Limitations

Primary schooling in Sao Paulo has serious limitations. In 1945, children of ages 8-13 represented a sixth of the population, and of these slightly more than half were attending primary schools, 60,000 received primary certificates, and only 25 per cent finish their courses.

S.E.N.A.C. takes care not to interfere with the existing private school organization. In this respect the law 8621 establishes that "S.E.N.A.C. shall also collaborate in the diffusion and perfection of commercial education with regular courses, with the award of diplomas, and the training immediately connected with it. . . . Where there is no recognized commercial school, or where the courses offered do not supply the needs of the district, S.E.N.A.C. shall complete the requirements of the law in order that . . . . courses shall be given, or shall provide the necessary means to stimulate private initiative to create them."

Each firm with more than 9 employees must engage one minor as an apprentice and enrol him at S.E.N.A.C. Larger firms must have 10 per cent of their employees as apprentices. Attendance is mandatory for apprenticeship courses, but voluntary, though free, for other courses. Scholarships and prizes are given to stimulate greater interest.

Apprenticeship Courses

Apprenticeship courses lasting 1 year are given for commerce (sales) and for office training. They include language, mathematics, merchandizing *or* office administration, commerce *or* typewriting, and social training. A model store is maintained for practice. These are for 14-18 year old students. Seventy-nine per cent passes were obtained in examinations for 1948. For students without primary schooling there is a preparatory course of 1 to 4 years duration. Post graduate courses are attended at night by pupils over 18 years of age. These are not compulsory. Eighty per cent passes were obtained in 1948.

Separate courses are also maintained for all types of office and sales employees in preparation for specific jobs. The travelling salesman course is given by correspondence. Radio courses are also given for commercial employees

E. B. Jubien

residing in the interior, with lessons broadcast from a central station. Some 3,200 students attended this course in 1948. Personality and aptitude tests before admission determine the choice of course to be taken; industrial, office or sales.

Social training is regularly taught. Students have little notion of their civic duties, and the problem of absenteeism clearly points to the need for this training. A well organized programme of sports, contests, games, musical programmes, excursions, libraries and students' club activities helps them to the enjoyment of a better life. S.E.N.A.C. is a successful experiment, preparing as it does thousands of young men for commerce and for a better technical career, for a better social life, through the application of scientific methods of training.

Discussion

Delegate—Those courses seem to be well laid out, and every assistance given to guide your students in even more than just a training in commercial business. How much is done to promote initiative on their own part?

Dr. Alvaro—They have guidance to organize the clubs, but they are supposed to run them themselves.

Delegate—Are any girls given these commercial courses?

Dr. Alvaro—Yes, this is quite a co-educational programme. By the way, scholarships for further study in the United States are awarded and we will see to it in the future that there will be some scholarships for Canada, too, I hope.

Delegate—Is yours a system of education based on the Portuguese?

Dr. Alvaro—No, it is entirely different.

Delegate—You seem to take a bit from everywhere. Your commercial training seems to be similar to that in Switzerland.

Dr. Alvaro—I don't think that nowadays we have any system in our educational combine that has anything to do with the systems used in Portugal. In the beginning we did, but now we try to follow Central Europe, and chiefly in the later years, the United States and Canada.

Delegate—Do the professional bodies, for instance the engineers, have in Brazil anything that compares to the Engineering Institute Student Guidance Programme for high school students?

Dr. Alvaro—The answer is "No . . . but." The engineers, again in the State of Sao Paulo, have established a foundation to furnish tuition and physical maintenance, buying books, etc., financing the studies of boys who want to become engineers but there is no guidance in high schools.

Miss Elsie MacGill, Toronto—I wonder if you have any difficulty, Dr. Alvaro, in the firms' attitude to your aprentices? Do they tend to exploit them at all or to require more business work than school time or to keep them longer in order not to employ higher priced employees?

Dr. Alvaro—The answer is that of course humans are humans everywhere and there is greed everywhere. Some of the firms would have liked to do that, but the law is against them. They can only use those apprentices for a certain number of hours per day, and now that minimum salary law says that even an apprentice has to get a minimum salary.

CO-ORDINATION

AN ESSENTIAL FUNCTION IN PROGRESSIVE MANAGEMENT

by

James L. Madden

Second Vice-President, Metropolitan Life Insurance Company, New York, N.Y.

Change is the key to the genius of American business. Take away the inventive character of business, and management "know how", and there would follow adverse effects upon our standards of living and general welfare. Spurred on by our enterprise system, management encourages individual initiative, ingenuity to find better ways to do things, and a constant urge to outdo competition by producing better products and services. These and other factors are inherent in orderly change and management.

The confidence of the American people in business institutions is reflected in the millions of market transactions each day, when consumers voluntarily select and pay for desired commodities and services. Concerns that give the public what it wants succeed in this continual referendum. Meeting the demands of the public is the primary concern of management, functioning within the broad fields of private endeavour. As our business structure has grown, management's problems have multiplied, and new methods have been devised to meet new conditions. For example, the growth of many concerns into large institutions has given rise to the need for an organized co-ordination function in management matters.

Top Management Structure in Large Concerns

The owner of a small business is so close to the details of his operations that he readily integrates the various factors which are essential to success. However, in a large business the complexity and magnitude of activities make it impossible for the chief executive to keep in touch with all operating minutiae. He looks to his cabinet of administrative officers for the proper supervision of specific operations, for current reports on results, and for suggestions on matters which may require his decision.

In the interest of efficiency, large corporations are functionalized, with each division limited to certain clearly defined functions. As a result, while the division heads are intimately acquainted with their own particular operations, their first-hand knowledge of company operations as a whole is necessarily limited. This presents an opportunity for the co-ordination function. The blending of the detailed specialized knowledge of the operating divisions, and the general overall understanding of the company's internal and external conditions, through co-ordination, produces a well-rounded and realistic base for the consideration of policy questions such as: What can be done to reduce operating expenses? How can productivity be increased? The answers must be based on orderly change and the full resources of good management.

Opportunities for Co-ordination in Daily Operations

Efficient business institutions are constantly trying to improve operations and avoid tendencies to stagnation. Alert division management contributes much toward these ends; but there is still a need to systematically view, through neutral glasses, the over-all operations of the company.

Co-ordination's approach must be both constructively critical and also creative—the first to seek out opportunities for improvement, and the second to suggest ways and means to achieve desired ends. This involves continuous studies of the organization of the company as a whole, the more effective integration of its component parts, the

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This was a continuation of the preceding session on Saturday morning, May 14. E. B. Jubien presided and outlined to the delegates the career of Mr. Madden and his qualifications in the field covered by his paper.

In addition to the vice-presidency of the Metropolitan Life Insurance Company, Mr. Madden is a member of the council of the board of trustees of New York University and president and chairman of the planning committee of that University. The average enrolment at N.Y.U. is 66,000 students.

He is chairman of the board of the Transportation Association of America, a trustee of the National Industrial Conference Board and chairman of the finance committee. He is a director of the American Management Association; also treasurer and member of the finance and executive committee.

Mr. Madden is a lawyer by training and profession and is a member of the bar of New York State and of the United States Supreme Court. He is a former member of the faculty of New York University Law School and a one time lecturer in one of the schools of the United States Department of State.

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appraisal of the mechanics of operations, and the functioning of organizational checks and balances—all with particular reference to their efficiency and economy and their soundness from a public relations standpoint.

In sparking new ideas or improving old ones, co-ordination is, in effect, an experimental management laboratory which uses various devices, such as "pilot plant" operations, for ascertaining the relative merits of a specific proposal. In the course of testing and probing, consideration must be given not only to technical phases, but also to those involved in the selling of new ideas to the various levels of management and others employed in the divisions.

As successful operations depend on the proper correlation of the human factor and the methods of operation, each co-ordination assignment must deal with this fundamental operating requirement. Do habits of supervisory thinking, operating procedures, and company rules and regulations tend to encourage maximum initiative and ingenuity by division staffs? Or is enthusiasm dampened by obsolete supervisory thinking or rules of the inflexible civil-service type? Have the human factors been given every possible consideration? Constructive answers to such questions help to create a healthy atmosphere and contribute to team play and progress. In short, good spirit in an organization needs to be fostered and safeguarded.

Individuality of Business

While a small organization invariably reflects the individuality of the head of the business, the executive head of a large organization cannot have direct contact with more than a few customers and employees. Various methods have been devised for bridging this gap, so that the leadership qualities of the chief executive may actually permeate the company's operations. Sometimes difficulties arise when these methods are inadequate or poorly executed, so, in the interest of good management, it is essential to check, from time to time, the extent to which the chief executive's administrative policies are actually reflected in internal operations and external services to the public.

Among other influences which affect a large business institution's reputation are the attitudes, thinking, and services of the numerous people on its payroll. This is another reason for studying the business systematically through the eyes of the public. Even though a corporation is administered successfully by executive personnel of the highest talents and abilities, there may be blind spots in its make-up which cause it to be unaware of things seen by the public. It is difficult for a corporation to appraise itself. Accordingly, studies of this kind are necessary if management is to be properly responsive to the public's reactions.

There are so many factors responsible for the general reputation of a company, that each must be weighed in the light of its particular contribution. This can be effectively done through co-ordination, because this function has no affiliation with any operating division, and not only has direct access to internal and external operating conditions, but also feels the pulse of public opinion.

Pach Bros. Photo

J. L. Madden

Approach to Co-ordination Activities

Independence of thought and freedom of action are essential if the co-ordination function is to be most helpful in business. Inherently, co-ordination must be an exponent of *orderly change,* relying upon various methods for accomplishing its purposes, such as constant reappraisals of company operations. To insure neutrality of findings, the officer supervising it should be a member of the president's administrative cabinet.

Co-ordination activities must recognize the intimate relationship between the welfare of a business and the public. Appraisals should be made with the public interest in mind at all times. In a large business organization it is seldom, if ever, that any one individual has the background to appraise operations effectively and fairly. The fact is, this requires the services of a combination of skilled management specialists who have the necessary time for intensive study, and the opportunity to spotlight any given activity and weigh it in terms of results achieved.

The Opportunity for Business Statesmanship in Co-ordination Standards

As appraisals require some form of a measuring rod for purposes of comparison, the co-ordination function should set for itself the highest standards. These should be realistic and conducive to the further progress and welfare of the business. They must recognize the vital necessity of *orderly change* to insure progress, and the importance of patience and proper timing in securing ultimate goals. Co-ordination standards fall into two categories—first, long range, and second, those which are possible of present attainment. The setting of standards presents a most unusual opportunity for business statesmanship and idealism, and for a realistic management approach to business problems—a prerequisite if net profits are to be earned.

A definite philosophy of business should underlie co-ordination standards or objectives. As fundamental economic laws are just as real and inexorable as moral laws, both are essential in formulating management policies, and in the daily operations of alert business concerns. Time and changing conditions require new applications of these laws, but the underlying principles remain the same. Accordingly, the character, the integrity, and the good faith of a corporation in dealing with the public, employees, and others are built on a much broader base than a purely legalistic relationship. As necessary as legal safeguards are, the things that a company can do for the welfare of its customers beyond the letter of their contracts, help to make it a worthwhile citizen in the community. In other words, a business should impose upon itself, as part of its programme of orderly change, the highest standards of action consistent with its welfare and that of the public.

Among other factors which may

be used advantageously as a base for co-ordination standards are:

(1) The effect upon business of the ebb and flow of the economic tides.
(2) The data obtained from a systematic search for information on the best in management thought and practices.
(3) A wholesome respect for the management methods in vogue in one's own business, although this is no reason for the continuance of a particular method unless it is ccrrently the best-known method.
(4) An intimate knowledge of the opportunities for improvement in company management operations.
(5) Recognition of the fact that the right to serve the public carries with it the responsibility to endeavour continually to provide better service at the lowest practical cost.

The matter of "selling" co-ordination standards—once they have been determined—is of major importance. A brief review of some methods used to help achieve these objectives may be of interest.

Co-ordination Surveys — A Modern System of Self-Analysis

Much has been said about self-regulation of business but little about the extensive efforts of business concerns to improve their operations constantly through self-analysis. "Management audits are a form of self-analysis which is one of the major activities of co-ordination, for testing the efficiency and economy of the business and its soundness from a public relations standpoint.

The welfare of the company requires that co-ordination surveys be made on an independent basis, with the chips falling where they may. They should be made by a trained staff of management specialists, who have the experience and training to know the proper background to discover opportunities for helping to bring existing methods of operation up to co-ordination standards. It usually develops that the desired surveys are made on a co-operative basis with the particular operating head whose division is involved. These "management audits" continually portray company internal and external operations in the light of changing conditions and the advances in the science of management. They help progressive division managers, by bringing to them a detached viewpoint of their operations based upon an up-to-date knowledge of the over-all company activities.

Building for the Future Through More Effective Planning Today

In developing ideas to meet competitive conditions, it is important to secure the active co-operation of division heads. They are close to current realities. Every effort should be made by co-ordination to serve as a friendly counsellor and aide to division heads in the planning and achievement of their objectives, consistent with the principles of progressive management, effective company-wide policies, and co-ordination standards.

There is a wealth of skilled management ability in co-ordination that can be used by division heads, —its staff consists of men whose education, training, and experience qualify them as consultants on various phases of management and public relations. They should be available on a loan basis to division managers, and work directly under their supervision or, if desired, the assignment can be carried out by co-ordination. Extensive co-ordination studies of company organization, functions, and procedures over the years have provided a reservoir of factual information that can be tapped at will by division managers. In a large organization repeated studies are necessary, to be sure that the constant changes in operating methods are consistent with the principles of good management. The objectives of co-ordination are only partially achieved unless the co-ordination staff has the opportunity to review proposed changes in organization, functions, or operations before they are made.

The Budget — An Aid to Sound Management

The planning that precedes the compilation of budget figures is one of the most valuable phases of a budgetary system, because it requires both company-wide and divisional scrutiny of the value of existing operations, and the definitizing of thinking in connection with new ones. Also, a budgetary system provides controls which help to assure the conduct of operations within specified expense standards. When properly handled it promotes effective management planning and controls; in fact, a budgetary system is one of the most effective aids to help management make adjustments to face the future that co-ordination can provide.

Alert management is constantly asking, "What does a particular activity cost?" A budgetary system, of course, provides appropriate answers through an expense-recording system which is company-wide in scope, and which brings together, on a dollars-and-cents basis, the actual cost of operations by divisions, functions and unit costs. But it should do more. It should reflect the maximum expense a company can rightfully incur.

The value of a neutral viewpoint by co-ordination is apparent in the appraisal of numerous questions. For example, has a division too much management personnel? How much emphasis should be placed upon public education from the standpoint of company public relations? Where does it become uneconomic to strive for perfection in certain types of routine operations? If comparable procedures are carried on in several divisions, has one division found a more economical way to perform them than the others? Co-ordination should facilitate these evaluation processes by developing various work-measurement procedures in co-operation with the top management of the divisions. Invariably these are based upon detailed standards which are the result of careful study in line with good management practices.

Every business has a "break-even" point for each of its products or services, below which it loses money. Good management requires a reasonable spread between the "break-even" point and the selling price. Co-ordination should not only help to establish these "break-even" points, but also should pay particular attention to the maintenance of approved spreads during the preparation of budgets. The amounts or percentages of spreads are not necessarily uniform and might justifiably vary.

A budgetary system can play a real role in both effective planning and the control of operations and expense. When the master company budget has been approved, co-ordination takes from each of the division's forecasts the items necessary for the service divisions to plan their work and sends the appropriate information to them, so that they may prepare for expected demands. For example, the Personnel Division will receive the Labour Budget, which indicates just how much management, technical, production and sales staff has been authorized for each division to perform the anticipated volume of work.

It is clear that there is more to a soundly installed budgetary system than merely a matter of bookkeeping. Of course, it evaluates each operation, places a price tag on what each is worth, and sets a standard of expense within which it should be conducted. When all of these costs are added together, there results the over-all company budget, which is then used for control and forecasting purposes. In addition, a budgetary system makes possible a perpetual inventory of operations in terms of efficiency, economy and public relations.

Better Management Through Training

What is the job of management? It is not enough to answer that management is responsible for the successful conduct of a business, because this generalization oversimplifies the actual facts. We have to understand what management is, because it is so complex. When we think about it we realize that management embraces a number of specialized fields. For example, some phases of business require men with leadership talents, others call for men with supervisory ability, still others, men with analytical or creative minds, and in many cases, personnel with combinations of these and other abilities are needed. The need for specialized training in the diversified fields of management has become more and more recognized. To illustrate, note the emphasis placed upon management training in our colleges and universities.

Forward-looking concerns are continually canvassing various sources, both inside and outside of their companies, for the purpose of recruiting young men of promise. The competition for the services of these young men is keen. While those selected are given special intensified training and then started on their practical careers, alert executives realize that even more organized management education must be provided to help them achieve the maximum of their potentialities. The effect is to build the capable but inexperienced young men of today into the executives and management specialists of tomorrow. Part of co-ordination's purpose is to accelerate a management - training programme of the foregoing type.

Promising young men from operating divisions should be welcomed in the co-ordination course when they have the necessary potentialities and conditions warrant their designation. Upon completion of this foundation course, the trainees from inside the company are returned to their own divisions, while those selected by co-ordination are retained on the staff for further development.

With co-ordination's background, educational programmes can be built around the specific objectives of greatest value to the company, as well as to existing management personnel. For example, some courses may be designed to help improve supervision, while others can stress the proper understanding and use of various progressive management techniques. As relatively few members of management personnel can develop a worth-while understanding of overall company operations, because of their specialized work, emphasis should be placed upon efforts to broaden their outlook. There are numerous ways to help, such as informal talks by outstanding leaders in the management field who can give from experience not only the theory of various techniques, but their practical application.

Management education is more than listening to practical lectures or reading constructive books; in fact, its scope includes the training received under divisional top management in day-by-day operations. We must remember too, that management does not work in a vacuum, but its work is interrelated with that of employees and, in many respects, is dependent for success upon their co-operation and support. Accordingly, it is important to have all personnel understand not only general company-management policies, but also company achievements.

What Does the Public Think?

Good will is a delicate asset. It can be built only over a period of time, but it can be lost almost overnight. As good will is vital to the successful conduct of business institutions, company executives must know what both the public and the users of their products or services are thinking. In small organizations the head of the business generally knows what his customers are thinking to a greater extent than is possible for the chief executives of the larger companies. Yet the operations of large companies have a greater impact upon the public than those of smaller ones, and the possibilities of adverse attitudes, opinions, and criticisms increase in proportion to the size of the company. Criticisms usually relate to the policies, methods of operation, and the irritations which are caused sometimes by employees. A clean house is the best means of keeping these criticisms at a minimum, and by this is meant a business that is not only efficiently operated, but one that is in tune with public opinion.

The general reputation of a company is obviously important, and so are any plans which help to make it more widely appreciated. Co-ordination can contribute toward these ends by following the changing trends in public opinion and taking effective action along public relations lines. Both of these objectives should be based on a carefully devised fact-finding programme to ascertain, from time to time, the reactions of customers. The time is past when a large business institution can rely upon the quality of its services alone as a basis for favourable public opinion. This needs to be supplemented by a well co-ordinated public relations programme to help bring about a wider appreciation of company policies and operations.

The basis of an institutional educational programme must be the specific public relations needs of an organization, with a full realization that these are changing from time to time. The successful attainment of the objectives of such a programme is dependent upon the imagination and efficiency with which educational messages are prepared and the selection of appropriate media. One must not overlook in institutional selling the vitally important part that employees play, because each is a " centre of influence ". As a result considerable attention should be devoted to ways to help them understand the company's accomplishments, hopes and ambitions. Particular stress should be placed on educational efforts among salesmen, because, when properly trained, they are the best good-will ambassadors a business can have.

As a sound public relations programme requires centralized control in a large organization, co-ordination should be specifically charged with the responsibility of developing a well-rounded plan and making it function effectively. This requires enlisting the co-operation of operating divisions. In all of this work, co-ordination should be expected to provide leadership and creative thinking which is forward-looking in character. Spurred on by implicit faith in the company and its management, co-ordination is in a most favourable position to help place the merits of a company before the bar of public opinion.

Conclusion

The development of the co-ordination function over the years is indicative of the progressive trend in management thinking. During these times of changing conditions, the science of management has consistently become more and more effective, and the American enterprise system has responded nobly to unprecedented demands. Those responsible for these results have recognized the importance of *orderly change* in meeting new conditions, and the need for new management tools such as co-ordination. This exercises a co-ordinating influence in a large organization, and appraises and reappraises company operations in a neutral, well-balanced manner in the light of their economic and social contributions to the public welfare. Furthermore, co-ordination helps to improve present and future operations by pioneering new management ideas, which are not only progressive and practical in character, but consistent with realistic idealism and the public interest.

Discussion

Prof. Erwin H. Schell[6]—What do you use as a base for this analysis work? Is it material from management courses, or from men who have been in management engineering?

Mr. Madden—The answer is a balanced management staff in the Co-ordination Division. In 1933 we started recruiting a staff of men of varied experience who could supplement each other. The thought was that collectively they could render a composite management service in the company, along the lines set forth in my paper. We have learned over the years that it is difficult to bring such men from outside and train them, because they lack the intimate knowledge of our operations, policies and problems. They are not easily adjustable to our own particular operations. So we now recruit promising young men and give them an intensive training course in our Co-ordination Division. Briefly then, I might say that our current management staff is still built around our original objective. But we depend more upon bringing to our Division, from the company and outside, bright young men who give promise of potential management ability, train them and bring them up.

E. A. Cross[7]—I would like to ask Mr. Madden what his experience or opinion is of the scheme whereby employees are encouraged to become minor shareholders in the company with a view to increasing their co-operation and increasing their efficiency in the running of the business.

Mr. Madden—I am sorry I cannot throw any light on this question because Metropolitan is a mutual corporation and, therefore, we have no shareholders. I do know that some of my friends in the manufacturing business have adopted this particular idea, but I do not know what their experience has been with it. I believe the National Industrial Conference Board has made a study of it.

Prof. James A. Coote[8]—I wonder if the speaker would give us some indication as to how they give these men this special training. Do they release them from company activities? Do these men devote their full time to these studies, or is this a part-time education?

Mr. Madden—We are now in the process of selecting twelve men. Ten of them will be holding the degree of Master of Business Administration. In addition, we always have some trainees from the company. We like to have a good balance between outsiders and insiders. Then we give them a year's course of training in a special course in our Co-ordination Division. They devote their full time to studies, although a substantial amount of time is required of each in learning how to apply, under skilled guidance, our management techniques.

Delegate—What percentage of your trained people do you expect to remain with your company?

Mr. Madden—We hope to retain all of them.

Delegate—What do you do if they want to resign to go with other insurance companies?

Mr. Madden—Nothing—in fact, we have lost several of our men to other insurance companies. However, our turnover among these young people is not large because we have good opportunities for them in our own company.

R. N. Coke[9]—I would like to ask Mr. Madden whether or not, in the formation of a great many committees in large corporations, there is a possibility that the top men in the divisions may accept less and less their own responsibilities and rely or hide behind, you might put it—this committee for their action rather than accepting their responsibilities and acting as they did in previous years?

Mr. Madden—I believe this is possible. In my remarks you probably recollect the emphasis I placed upon the fact that all credit for the work of a division has to go to the top divisional management. With this credit goes the responsibility for successful results. In my opinion, company management should make no management committee set up which relieves top divisional management of its responsibility.

E. R. Brannen[10]—I would like to ask Mr. Madden if he could tell us a little about the means used to discover special aptitudes in these people. Do you use standard aptitude methods or do you rely on the experience of those who are screening them?

Mr. Madden—There has been a lot published about aptitude tests but thinking in terms of selecting our trainees, we do not use such tests. We want young men who can make good in management work, and we have yet to learn of any tests that will help us to measure their integrity, their ability to get along with people, their adaptability, their creative instincts in management matters, their persistence, or their loyalty to the company. There are other traits too which are absolutely

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[6] In charge of the Department of Business and Engineering Administration, Massachusetts Institute of Technology, Cambridge, Mass.

[7] Consulting engineer, Toronto, Ont.

[8] Consulting management engineer, Montreal.

[9] Chief engineer, Operating Division, Quebec Hydro Electric Commission, Montreal.

[10] Plant superintendent, Chats Falls Generating Station, Hydro Electric Power Commission of Ontario.

essential if one is to make good in management work in our Co-ordination Division,—and at the end I would add the very real factor of hard work, in order to make good in business. Answering your question specifically, we rely upon our experience in selecting promising young men. However, we have a lot of respect for the aptitude and other tests for certain types of work.

Delegate—The problem of communication up and down the line in organizations is a bugbear. Would the speaker develop any ideal modern techniques in the problem of communicating between top, middle and lower management. How do they get their reaction in a reasonable time so that top management can take effective action?

Mr. Madden—This should be one of the responsibilities of the co-ordination function. Even then, there is no one simple answer. Every firm has to study this in the light of its own policies and conditions, and the manner in which its top and middle management operates. There are a number of aids to sound communication between the various levels of management, and one is a policy of promoting from within.

George Henderson[11]—Mr. Madden, how do you go about placing in your organization the young men you have brought in from the outside and trained for a year, so as not to cause any dissatisfaction for people on the staff?

Mr. Madden—We endeavour to keep them in the Co-ordination Division for several years. In fact, we like to keep them longer, if we can. Then they are infiltrated into other divisions of the company as they are asked for, so we have no problem because we do not let anybody go until we have a specific request for their services, and we know that the trainee is not only willing to go but we believe he can make good.

Prof. Schell—There is one question, Mr. Chairman, on which I would like to hear Mr. Madden's viewpoint: the problem of administering the executive organization, that is to say, the hiring and training of the executives themselves. That has been discussed up to a certain point. Another tough problem is how to retire top executives. Would you be willing to speak on that, too?

Mr. Madden—I believe it is the responsibility of the board of directors and the president to develop and administer a plan for selecting and training executives suitable to their particular condition. In every organization there has to be one boss, and it is his responsibility to select his cabinet or senior officers. In an organization like ours where we promote from within, and when I say that, of course, I don't mean our lawyers, doctors or specialists who have to be gotten from outside by the company, obviously the chief executive is in the position to know a man's record back over the years.

Now as to the question on the retirement of executives, the fixed retirement system seems to be the most practical one. In saying that, I know that an organization sometimes loses valuable executives under this system. The same is true for other classifications. Only last week in talking this matter over with some of our university officials, I learned of a law school out in California which probably has the best law faculty in the United States. That faculty is composed of men who have been retired, men who have been preeminent in their respective departments. They are engaged on a one year basis and if their health is not good they are not re-engaged. Some of these men are able to give the best service of their lives. However, on the net basis, the best system developed so far, I believe, for solving the problem of which you speak, is the fixed retirement plan.

E. B. Jubien—I am sure that by the nature of the questions and the attention your audience has given this morning, Mr. Madden, they have expressed in a better way than I can, our thanks and appreciation for the very interesting talk. On behalf of everybody present I would like to thank you most sincerely.

[11] Montreal, Que.

Management Policies in a Post-Boom Period

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A panel discussion on Saturday, May 14

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Chairman

Elliott M. Little

President, Anglo-Canadian Pulp and Paper Mills Ltd., Quebec

Participants

R. L. Bowditch, *Boston* **G. Blair Gordon,** *Montreal* **McNeely DuBose,** *Montreal*

J. W. Barriger, *Chicago* **E. O. Griffenhagen,** *Chicago*

Elliott M. Little — Ladies and gentlemen, the panel discussion this afternoon is entitled "Management Policies in a Post Boom Period." I would like to introduce the members of the Panel. Mr. Richard L. Bowditch, is president and director of C. H. Sprague & Son Co. and the Sprague Steamship Co. of Boston. Mr. G. Blair Gordon is president and managing director of Dominion Textile Co. Ltd., cotton manufacturers. He is a graduate of McGill University in electrical engineering. Mr. McNeely DuBose, is vice-president of the Aluminum Co. of Canada Ltd., a synthetic Canadian, born in Asheville, N.C., and a graduate in electrical engineering. Mr. John W. Barriger, is president of the Chicago, Indianapolis and Louisville Railway Co. and vice-president of the Union Stock Yard and Transit Co., in Chicago. He is a graduate of Massachusetts Institute of Technology. Mr. E. O. Griffenhagen is the senior partner of Griffenhagen & Associates, of Chicago. He is also president of the Association of Consulting Management Engineers.

It might be worth while to take just a moment or two to say what we mean by the Post-Boom period. For the past nine years, since the outbreak of the war, practically the sole emphasis in business and industry (for almost every type of commodity) was placed on the production of goods in increasing quantities. During the war a great part of our productive facilities had to be turned in the direction of producing goods of war. In many cases the production of goods for civilian use was reduced to a minimum. This was the case in most parts of the world.

It appears from surveys in business and industry over the last few months that the boom created and stimulated by the war is now receding in varying degrees. Some people describe this recession in various terms such as disinflation or depression. Which of those three definitions is liable to be the most accurate will, I think, depend a great deal on collective action by management in industry and business. To a degree, not as individuals but as a group, the decisions that we make will have a bearing on whether we are going to have disinflation on the one extreme or depression on the other.

It is difficult in this short period of two hours to try and cover, not only the principles governing those policies, but particularly how you are going to carry those policies out. I think we can agree that there are some general guiding principles which can be brought out, but if we get into a discussion of how those things are to be done, we will see that they vary from industry to industry, and from business to business. With that in mind, and with the preliminary discussion we had this morning, we felt we would confine our discussion to five major questions.

The first three of the five questions fall into a group dealing with the measures which management should take for the maintenance of volume production. Under that heading come (1) our price policy; (2) our policy on quality changes and changes in the type of product; (3) the changes in the extent and determination of our sales effort.

A second group of questions which govern the actions of management if volume cannot be maintained, fall under the following two main headings: (1) The policy regarding the reduction of inventories and purchases; (2) The reduction in our labour force.

I think you will agree that the extent to which you have to take action in those latter points with respect to your labour and your purchasing in your industry are going to be governed to some degree by the extent to which you change your prices and quality, and by what success you have with expansion or diversification of your sales.

There has been one theme, if I might mention it at this stage, and I think the men on the Panel will probably bring it out,— which has run all through the discussions we have had up to now, and especially at the preliminary discussion we had this morning. It is that everyone in management wants to build stability into his business. You want stability of profit, stability of employment, and in every aspect of the policy decisions you make. It seems to me that is the guiding factor. I am not trying to confine the remarks of the members of the Panel, but it seems to me that, as far as possible, our discussion should resolve itself about those decisions of management policy which will result in the stability of business.

I am now going to call on each member of the Panel for his contribution to each of these questions. The first subject for discussion is the effect of our price policy with respect to the maintenance of the volume of production.

Richard L. Bowditch—The question of price policy in this post-boom period as we see it today is probably one of the most important, if not the most important of the questions with which management has to deal. It is my feeling, definitely, that whatever we do should be done as gradually as possible, so inventories on hand may be liquidated in an orderly fashion, and so the public and labour should not be particularly alarmed and thereby start a panic wave of buying, or a possible speed-up toward what might be a depression. In other words, what we do is as important as how we do it, and vice versa. It is a little like the song, "It is not what you do but the way that you do it."

We must make an orderly approach to this price question, and in that orderly approach we must bear in mind that our competitors are facing the same problems. In collectively trying to keep stability uppermost in our minds, and eradicate the peaks and valleys of business, an orderly approach to the price question is all-important.

Now I realize in some businesses, with changing conditions, especially the changing conditions which war thrust upon us overnight, in a world which is speeding up, as Professor Schell told us, sometimes one cannot adjust his business to these orderly procedures. New conditions arise overnight. One of these new conditions facing the coal industry and the oil industry is the quantity of oil going to Europe from the Near East and replacing Venezuelan oil which is coming into the United States. That is something from outside which is a new force and of considerable importance.

E. M. Little

Mr. Chairman, I know you have limited us to two minutes. The thing I wish to leave uppermost in your minds is the necessity for orderly procedure, an orderly reduction of prices if this is to be but a minor recession.

McNeely DuBose—I am not an authority on the subject, but the first thing I think of is that in the event of a post-boom period, people commence to hold up on buying. The natural reaction of the producer is to cut the supply if he can. If every producer cut the supply enough, that would settle the problem. However there are many who cannot cut the supply without an upheaval. It would be a pity for those producers to cut more than they efficiently can. After all, we are trying to attain stability. If the supply can't be reduced, then the next avenue to examine is obviously that of price reduction as a means of maintaining production volume.

G. Blair Gordon—I think at lunchtime when Professor Schell mentioned an orderly retreat, it was particularly pertinent to the whole price picture. A properly prepared position to fall back on makes for better acceptance on the part of the public. If they become afraid, that will have a worse effect on buying. If the people have an idea that this is just part of a long series of price reductions, the effect will be very bad. If we can get some clear definition of what is going to happen for the time being, even for a six-month period; if we can gauge our price reduction on some basis of sound reasoning, it would be of some help.

In our type of business, of course, we can point to the cotton crop and can say that next October cotton may be worth a certain price, and it gives us something to retreat to, rather than just having a vague, disjointed retreat that may have no ending, as far as the buying public can tell. I think tradewise that has quite an important effect on the situation.

Mr. Little—I would say from the remarks that the prime purpose of any business man, or of management, would be to try, if at all possible, to inject as much stability into his business as he can. While that may be extremely difficult, there is no use feeling depressed every time he loses an order, but it should make him appreciative of the fact that business under these conditions is changing all the time, and we have to be flexible.

E. O. Griffenhagen—Of course your revenue is a product of price and volume, and if you cut price you cut revenue. If you cut volume you raise the unit cost, which makes it harder to cut price, so there is a double-headed result, an accumulated result. I would say it is an important responsibility under those conditions on the part of management to know the costs, and to do everything possible to reduce every element of cost, if the price cutting is to be done without disaster.

I would like to use perhaps more than my two minutes, with the promise to pay it back with interest on the other questions, to comment on a point I raised in our brief breakfast discussion on the use of terms. Our topic this afternoon is "Management Policies in a Post-Boom Period." I think from what I heard as you outlined our problem, that perhaps the term "Business policies in a Post-Boom Period" would be more appropriate. It might be wise in the beginning to make a distinction between business and management, but I am using business in the sense of a

Canadian Panel Members

G. Blair Gordon

Photo by Karsh, Ottawa.
Reprinted from "Who's Who" in Canada

McNeely DuBose

The Canadian point of view was presented on Saturday afternoon by three prominent representatives of major Canadian Industries.

Mr. Gordon is president and managing director of the Dominion Textile Co. Ltd., cotton manufacturers, Montreal. He holds directorships in several of Canada's largest business and industrial concerns.

McNeely DuBose is vice-president of the Aluminum Company of Canada and director of several of its associated companies. His record includes a wide experience in electrical utilities in various parts of the world.

Elliott M. Little, the moderator of the panel, is president and general manager of the Anglo-Canadian Pulp and Paper Co. Ltd., and its associated companies.

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commercial operation, and management as a term that would apply to any enterprise.

In my own thinking I have tried to define the functions of management. It is the conduct of an enterprise where a product or service is to be provided of the desired quality, and at the right time, with the least expenditure of manpower, material and other resources. If this is true, that requires management at *all* times, and not only at recession times or times of trouble, but in times of prosperity as well, to consider questions of organization, of procedures, of facilities, of materials, of personnel and general administrative planning and control. I use those six categories advisedly, after having found it convenient to put my own thinking into them.

It seems to me that if management has a responsibility at all times, there is really not much that it should do in post-boom periods that it would be not be doing right along. At least it would be using the opportunity in time of prosperity to get itself ready to use these devices.

E. M. Little—I might say for the benefit of the people here that this morning at breakfast we had a little discussion, and Mr. Griffenhagen took the view which he has just expressed. Some of the rest took the view that there was practically no difference between the terms business policy" and "management policy" because to a large extent management policies are governed by what decisions you have to make on business. I want to thank Mr. Griffenhagen for expressing his interesting viewpoint.

John W. Barriger—The price structure in a system of private enterprise adjusts production and consumption. We who believe in this capitalistic organization of the national economy also believe that, if left alone to work naturally, economic action and reaction of the factors that converge upon the price structure will automatically stabilize it at a level which will ensure much larger consumption, and hence production and employment, than would follow any artificial regulation — i.e. manipulation of prices.

Price declines affect corporation earning power, and this in turn influences financial factors, which affect security values and the purchasing power of business. If the latter decrease more than proportionately to the price reductions to which they are related, deflationary factors set in which dry up business. Price decreases may be of two classifications: (1) those which widen markets and expand business; (2) those which shrink purchasing power and dry up business.

What are the distinctions between the two? The former are those which follow the orderly working of competitive factors and thereby give the public the benefit of technical improvements in manufacture, etc., and lower costs of materials, better administrative and sales methods, etc., but still protect a profit margin that represents a fair return upon the investment required to produce the goods or services sold are price decreases of the type which enlarge markets. The American standard of living was built upon mass production and price decreases to enlarge markets. The latter, the deflationary decreases which destroy markets, are brought about by the disorderly price changes resulting from liquidation, usually involuntary, of goods, securities, and property in a rush to transform assets into cash, irrespective of sacrifices.

It is my own opinion that the financial position of corporations, banks and individuals is such that there is little reason to fear that the price changes, now going on or in prospect, are of the latter deflationary character which destroy business volume. Instead, they are of the former constructive character which will build business volume. However, bitter memories of the depression decade of the thirties are still so painfully present, that we instinctively associate any price change with deflation, and overlook the fact that the primary function of the private enterprise system is to pass on to the public, through the working of competition, the continuing improvement in methods and technique of production and distribution. This is usually done through lower prices.

Competition keeps business healthy and strong. It is the one thing that private enterprise has to offer the public which it cannot obtain from a controlled economy, but that is everything. These price changes we are now undergoing represent a return of competition and should not be confused with deflation.

Mr. DuBose—I would like to remark that only by increased efficiency or by decreases in purchase costs or labour rates may prices be reduced legitimately. But there are certain businesses which have been earning above dividends by a margin which they needed to expand the business. It has been difficult in recent years to get money from the public and some businesses must expand over a period of time in order to live.

Good management might dictate in such cases that, in order to slow the recession, some of the money which was to have been devoted to expansion should be applied to the maintenance of production volume by building up inventories of product, and thus postpone, or even avoid the problem of reducing prices. Personally I think that would be very sound if it were done within the limit of the economy of the business.

Mr. Griffenhagen—Of course the primary reason for making certain improvements in facilities is to reduce costs by substituting machine work for hand labour. Using those terms in the broadest sense possible, the very time when you want to reduce costs, you reduce your opportunity to earn money, so that is the place for outside capital that is so hard to get these days, especially after the tax collector has been around.

Mr. Little—I am going to stick my neck out a bit and try to risk a summary of the views as expressed by the members of the Panel, both here and during the discussion we had this morning. The importance which the members of the Panel place on price policies is pretty well indicated by the fact that it is the first item under discussion. I think it is the combined view that the price polices of management will govern your actions on the subsequent topics for discussion, and that what you should do about prices is difficult to determine.

I think Mr. Barriger brought out an important point, to the effect that the proper price policy would be that of finding a level designed to stimulate the volume of sales, without being so low as to bring on disinflation or depression, about which everybody is concerned. I believe the second most important point made was, that whatever is done should be done in an orderly fashion in the hope that some stability, even at the lower levels, might be maintained, and to make that contribution so as to avoid panic. Our actions unquestionably must be such that no panic will result—panic in the labour situation—because that would not be in the interests of good business. If we want to take the long term view, we should do everything to maintain production, in order to successfully weather a bad business period.

I think management has a high responsibility to see that a panic situation is not brought about, the tendency for which is always great when anything happens to the business levels except when it is on the upside.

We have covered this first question in the time allotted to us, and I would ask you to give your consideration to the second question dealing with the measures for the maintenance of volume by changes in type, and by the quality of the product. I am going to ask Mr. Gordon to start the discussion on this point.

D. Blair Gordon—In speaking of quality, I think we should first define in our own minds exactly what we mean. The term "quality" in the first place would mean absolute quality, that is, the type of the product, a good grade. For instance, in speaking of motor cars it would mean the difference between a

American Panel Members

Photo by Bachrach

R. L. Bowditch

Fabian Bachrach

J. W. Barriger

Photo by Wallinger

E. O. Griffenhagen

The National Management Council was represented on the panel by two transportation executives and an eminent management consultant.

R. L. Bowditch is president and director of C. H. Sprague & Son Company and Sprague Steamship Company of Boston. He holds a number of important directorships and has been active in the work of the United States Chamber of Commerce.

J. W. Barriger is president of the Chicago, Indianapolis and Louisville Railway Co., and vice-president of Union Stock Yard & Transit Co. His engineering degree was obtained at M.I.T. in 1921 and he has had extensive and varied experience in all phases of railroad operations.

E. O. Griffenhagen is president of Griffenhagen and Associates, consulting management engineers, Chicago.

Chevrolet and a Cadillac. Then there is the relative acceptance of quality, within a certain grade or type of product, the value you get for your money. From the first angle, the angle of absolute quality, it seems that the management of a company in a post-boom period is at the mercy of general economic conditions, where they are producing an article that is finding its way to the public in end use form. In this case they are pretty well bound to lower their sights a bit, and concentrate their greater production on the lower level price brackets, in order to fit the public's purse.

When it comes to the relative quality, the quality of that article that they decide to make, and are going to concentrate on, I think that the situation is quite different. There, if anything, the tendency is to maintain the quality of that product, even to enhance it a bit. Everything going into that product is probably a little bit cheaper, and they can afford to sell a certain article at a certain price. Being in the textile business I think in terms of things like shirts and women's wear, etc., where there are certain ear-marked prices—you see them every day in the papers, $2.49 for a woman's house dress and $3.49 for a man's shirt, and at those well-defined price levels it so happens that in time of rereat, if you want to call it that, it is important for the manufacturer of that article to put in a little better quality of merchandise, because he can get his raw materials slightly cheaper. Therefore we have the paradox of absolute quality coming down the scale and relative quality going up at the same time.

E. O. Griffenhagen—I have not many ideas on the subject, except that it seems to me to indicate the importance of research in order to fix the scale, and to find something which will serve the purpose and be of a lower grade, to use Mr. Gordon's term. Something is being attempted along that line in the housing field, so far with rather indifferent success, and it still ought to be done in the automobile field.

The other point is, to carry on the paradox, that during the war or the immediate postwar years the public wanted things so badly that they would take anything at any price, and we allowed the quality to go down. There is a great danger now that anyone managing a business, and wanting to make up in part for this price reduction, will continue to turn out unsatisfactory goods, in which case, if this is a temporary recession, the reaction might be very hurtful.

John W. Barriger—Quality represents a variety of different factors. First there is appearance, which is so important in consumer goods. Second, there is the durability or service life of an article. Third, there is its service content, for example, the heat value of fuels, the strength of materials, and so on. Fourth, there is quality measured from the standpoint of the cost of future operation and maintenance. Each one of these is distinctly different from the other.

We all know that quality is a vastly important although hidden component of price. Thus the inflation in prices during the war and the immediately succeeding years, when counted in terms of dollars, was only a partial measure of it, because in all too many instances, quality deteriorated while prices rose. That was an additional but disguised price boost, nonetheless painful to the consumer because it was hidden. That applied whether one was buying raw materials or semi-finished or finished goods.

That, of course, was but one of the evidences of a seller's market. Quality usually suffers in a seller's market. Inferior quality in relation to previous standards is sometimes looked upon as a legitimate method of giving the purchaser something less than he thinks he is buying. If he is buying a suit, for example, and the seller is dissatisfied even with the boost in the quotation, he would not dare leave off one leg of the trousers, or the vest, or the back of the coat, but, in effect, he does just about the same thing by reducing the durability or wearing quality of that suit in relation to past standards.

Many other analogies could be made to show that short measure through lowered quality is done in a legal and legitimate fashion, satisfactory from the standpoint of the seller, but most unsatisfactory from the standpoint of the injured customer. However, the latter has little or no redress. The poor quality of goods which have been palmed off on purchasers during the last decade in many lines of business, as a result of inflationary factors, has built up buyer resistance which is now a factor in handicapping present markets. Prewar quality of goods must be restored, plus the improvements that represent the advances in technique and the normal progress of the intervening years. This is necessary in order to bring buyers, both individual and corporate, back into the market in the numbers that are required to hold output, employment and profit at satisfactory levels. Sales effort will be necessary to convince a skeptical public that this has been done.

R. L. Bowditch—On the question of quality, sometimes just quality, even in the many ramifications and classifications that Mr. Barriger has mentioned, is not enough. You take some of the basic business organizations, such as my own, the coal mining business. During the war we shipped coal, anything that was black that came out of the ground had to be mined and sent to many places throughout the world. But today anyone who hopes to retain a market must take quality into consideration.

I want to stress research, research for new uses for basic commodities. When you have a worldwide impact on certain industries of a raw material like oil and another basic commodity like coal, which overnight may throw literally hundreds of thousands of workers on the relief rolls, or whatever you want to call it, something must be done. You have to have more than just quality of the product; you must have quality of ideas and quality of research.

McNeely DuBose—In the attempt to overcome the buyers' resistance, if you cannot reduce the price, the question that is bound to come up is: Can we, by reducing the quality bring the cost of the product within reach of the buyers? That is another way of reducing the price. But experience has shown that in times of depression, with the manufacturers competing against each other, it is almost always essential to increase the quality, not decrease it; otherwise you defeat what you are trying to do. For myself, I can't see any hope of maintaining sales volume by decreasing the quality, although there might be some lines where that could be done.

E. M. Little—Any other comments, gentlemen? If not, I am going to let the gathering decide on its own summary of this matter, and go on to the next point for discussion. Mr. DuBose, will you comment on the measures to be taken for the maintenance of volume, or the policy management should follow in respect to sales.

McNeely DuBose—I suppose if people are not buying, the natural reaction is that we should try harder to sell to them. But first we should question:—Why are people not buying? Presumably they are not buying either because they have not enough money, or they are afraid that soon they will not have enough money, or else they are holding off for a bargain. In the third case, sales effort could accomplish a great deal. If you can make the buyers think they are getting bargains, they will all want to buy.

In the second case, if they are holding back because of fear that they may run short of money, sales effort could do much to build up courage, by convincing them that stability will be maintained. But in the first case, if people are not buying because they do not have enough money, extra sales effort could not make them spend more than they have. If would only result in a case of robbing Peter to pay Paul. An intensive sales campaign at a time like that might be attended by much more danger of depression than otherwise.

Management should enquire very seriously into what is causing this condition which we call a post-boom period, and guide its sales efforts along lines that will at least be safe, I would suggest a line of sales effort which attempts to quiet fears, and to give the public a feeling that this is just a recession. It is going to be a case, as we heard it expounded the other day, of merely tightening the belt and not of losing the belt and the pants, too. Sales work along those lines, I think, will accomplish as much as can be done to help the general situation, as well as that of the interested producer.

E. O. Griffenhagen—Well, it is probably a platitude just to say that the sales problem has to be approached differently. If you consider the individual business, if you consider the industry, if you consider competition among industries, each individual business, of course, is under the strongest incentive not to be the first one to be pushed out.

I was in California during the winter and I heard a discussion on the loss of the orange crop. One grower said he had lost 20 per cent of his crop and another said he had lost 85 per cent. If we were considering the thing on an industry-wide basis we could say: Shall we reduce the price and let people just come in and buy? Or shall we send out a sales force and battle with the other fellow and take it away from him? Of course we have always had the problem among industries of which one should get the limited consumer dollar.

From the standpoint of management technique, I would like just to mention the personnel problem as involving selection, training and incentive as it has been applied to factory workers. There has not been much said about that recently in connection with sales forces. Maybe that will have to be considered soon.

J. W. Barriger—Modern mass production methods of manufacture and distribution have been geared to very high levels of output. Successive technical developments in every line of economic activity have pushed the so-called break-even point higher and higher in each industry and in every company. On the other hand. as our standards of living advance, and the bare necessities of life, measured in terms of minimum essential quantities of food, clothing, shelter, and other "indispensables" consume a continuously diminishing proportion of each individual's earning power, an increasing proportion of this income remains to buy "dispensable" goods and services.

The higher the standard of living becomes, the larger the proportion of these non-essential or "indispensable" goods will represent in the economic life of the individual and the nation. The larger the proportion of "dispensable" goods becomes in relation to "indispensable" goods, the greater the possibility for a deflationary depression if we permit the economic forces that are facing us today to get out of hand.

We must recognize that the productive capacity of North America is immense. It must be kept at work. We can only achieve this through high levels of distribution and consumption as well as production and output. Individuals and corporations must regard money more as a medium of exchange than an evidence or object of wealth, if America is to achieve its maximum output of goods.

R. L. Bowditch—As regards quantity, we might say versus quality, as a means to keep employment going, it is most important, to my mind, to make the right decisions on quantity. Where do you draw the line? Where do you work in that extra day at time and a half or overtime? Is your sales force adequate to put out the quantity and distribute quantity production?

In the last number of years the sales forces have been doing next to nothing, because people have taken the goods away at high prices without selling, due to a great scarcity and to the pressures of the times and other factors. We, I think, should look toward other markets that have not hitherto been tapped. Possibly we will need additional salesmen.

I do not wish to criticize unduly the brokers in any business at all, because there are brokers and brokers, and there is a real reason for having the in-between man to bring both sides of many pictures together. But I would like to emphasize the importance of controlling our brokers because, as was stated this morning, they oftentimes are merely looking for commissions, and do not understand the problems of production, either quantity or quality.

G. Blair Gordon—I think the only thing I might add to what has already been said, is that strangely enough the effect of post-boom buying, or restraint from buying, is not just what people think it is. One would imagine that in the time when money is perhaps getting a bit less free and easy, that people would economize on luxuries such as radios, motor cars, etc., but it does not work out that way by any means. They are inclined, if anything, to do quite a bit of their economizing in the every-day things that they can make last longer, such as wearing apparel and things like that. The companies engaged in producing those things are just fooling themselves if they think this sort of period is going to help them. They need to put forth every effort if they are going to hold their own.

If people have more time on their hands, through short time operations of plants, perhaps they will have more time to go to the movies. You cannot put these things down to any laws of reason. You have to realize that it just works out that way. I think industries turning out staple articles for everyday use have to realize that, and increase their sales efforts in order to keep up the volume.

E. M. Little—Once again, I am not going to try to summarize the answers, but am going to let you make up your own minds. It seems to me, however, to be a guide to management and it is something on which we can meet on common ground. In a situation of a buyers' market, where there is only a limited amount of money available, it is silly for people to indulge in cut-throat competition. Yet we are in conscience bound to put forth sales efforts, to do anything we can to stimulate volume and maintain the higher level of volume production. It is possible that in the past there have been too many efforts made individually to go out and compete in the markets available, rather than uniting these efforts on things that are going to stimulate that market.

That covers the discussion on the three questions that we tied in with the problem of maintaining volume. The next point, then, that we want to discuss is covered by two questions, (1) the reduction in purchases and inventory and (2) reduction in labour force which may be necessary on the part of management, if volume cannot be maintained by these points discussed previously. I am going to ask Mr. Barriger if he will start off the discussion. What action do you think should be taken in connection with reduction in purchases and inventories in the event that volume cannot be maintained?

J. W. Barriger—I feel a certain degree of hesitancy in discussing this subject, because it is one problem which the railroads have to a much lesser degree than industrial organizations. Railroads have no problem of inventories of finished goods because the product is a perishable service. A railroad must find a purchaser for its transportation the instant it is produced or it is gone forever. The railroad cannot store the finished product or service. The inventories of materials and supplies used to operate railroads are quite small measured in terms of ordinary consumption. An exception is coal, of which, thanks to Mr. John L. Lewis, the railroads try to keep a sufficient supply on hand to run them over whatever may be the next holiday period that he is supposed to be contemplating.

Inventories are probably the crux of this whole deflationary problem we are now considering. If the inventories of industries and distributors over the country are moderate in relation to normal needs, necessary price adjustments can be made in an orderly fashion and with reasonable celerity, and without starting any chain reaction that will create the deflationary forces we fear because they lead to panic.

If we really do have unwieldy inventories on hand, they constitute economic dangers. Measured in terms of dollars, inventories look very high; measured in terms of physical units they seem to be on a more manageable level. Fortunately the financial position of most corporations is such that they are able to carry their own inventories with a minimum of banking support, and this mitigates deflationary dangers.

There seem to be no deflationary factors such as were the important causes of the troubles of 1920. That brief depression arose largely from the liquidation of corporation inventories of goods. The 1929 depression started out with liquidation of personal inventories of securities. Then the banks liquidated their customers, and after that, the customers turned around and liquidated the banks. Businessmen have learned as much about managing inventories as they have learned about sales and about factory methods. One of the most important changes in that respect has been the so-called "LIFO" method of valuing inventories and pricing sales.

We have been led to believe that inventories have been managed on the upturn from the standpoint of business necessities, and not from speculation for a price rise. If that is the case, we are relieved of an economic explosive possibility which has burst in the past. Too often corporations have speculated for additional profits through inventories, and have had this blow up in their faces. Let us hope that, if we run into a recession, corporations will not speculate on the bear side of inventory policies.

I think that, of all the subjects which have been introduced today, this one on the inventory situation is the one that is susceptible to the most precise statistical analysis. Inventories are not at burdensome levels, and I do not believe that these offer any danger of touching off a deflation.

McNeely DuBose—We are talking about a depression, that is a disease, the first symptom of which is the failure of the customers to buy all the goods that are being produced. We have discussed several ways of treating the symptom, but it seems to be this question of company purchasing is really the first question directed at what causes the disease. Management must accept the responsibility that the disease is caused by producing more than people will buy and not the reverse. The first thing management should do is to try to get people to buy more but, if it can't, then the manufacturers will be forced to reduce production, and the step in that direction is generally to reduce company purchases.

E. M. Little—Is it not our own actions on inventories that may be the very things that are injecting this instability that management is trying to deal with?

McNeely DuBose—That is it exactly. When management feels this decline in purchases by the public, it wonders if it can be bolstered up by sales effort, or by improvements in quality or other forms of price reduction, but management is afraid it can't, and since in many businesses consumable materials must be ordered years ahead, the natural reaction of management is "Let's not buy quite so much."

When the companies begin to buy less, that affects the employment of those who supply the companies, which in turn reduces the purchasing power of the public, partly by reducing pay, and partly by producing fear that individually they may soon be out of a job. So such action of management impinges on a bad situation, and in the wrong direction. I feel that management's decisions regarding purchases at the beginning of a post-boom period are of such particular importance to the general well-being of the country that every effort should be made by each company in the course of protecting itself and its interests to do as little as possible to increase the instability that is already commencing to take place.

R. L. Bowditch—I feel this inventory problem is a most important one, and that at this particular time there is a certain amount of jockeying back and forth between buyers, to see who may spot the point where raw materials which go into the manufactured product are the lowest. I think it is a very dangerous thing to do. I think the orderly reduction of inventories, as far as is humanly possible, should go on even in this post-boom period. Otherwise a major break in prices would occur, if any major dumping on the market to get rid of inventories should happen. I feel exactly the way Mr. DuBose does about the situation.

G. Blair Gordon—I think the first thing that hits most manufacturers, from the inventory angle, is the fact that they see a let-up in their sales. They are immediately faced with the problem of how long they can carry on their current rate of production, and they see this inventory beginning to build up. They must face two physical considerations; first, how much space can they give to storing the finished product; and secondly, how much money can they afford to tie up in their inventory before they run short of capital.

On the buying side, of course, I think most of us would be inclined to pretty well cut our coat according to our cloth, and if we see that the demand is not there we certainly will not go out and buy more raw materials than we thought we could use. If we have the raw materials in stock already at fairly high values I don't know that there is much to be gained by keeping it there and perhaps the best thing would be to go on manufacturing and turn the raw material into finished goods. We will have to take a loss, but we would have to take it sooner or later from the standpoint of maintaining employment and not contributing to the general instability and panic. The best thing to do with raw material is to make it into the finished goods and keep employment up for a while and let us hope that before too long the situation might pick up again. I think that is the way the average manufacturer looks at the situation.

E. O. Griffenhagen—I think this subject has been pretty well covered. I would just be inclined to comment that if business is caught in the position where it has to consider dumping, it would seem to indicate pretty clearly that both business policy and management practice have been weak and that stresses one point. Recently we have had considerable improvement in the whole field of inventory records and formulation of order cycles and current reports both as regards raw materials and operating supplies and finished goods. It is astonishing to find the lack of co-ordination, due to a lack of unified consideration or integrated methods of procurement, storage, issuing and supplying, warehousing, elements of which one part of the business will continue to build up while the other is cutting down.

E. M. Little—I might add one comment. I think the inventory proposition is an important one and I agree with Mr. DuBose that the action of management in its policy with respect to the rate by which it reduces inventory can make a contribution to the instability which we are trying to avoid. It varies with the industry. We have the situation of the railroads. Theirs is an industry where no great provision for raw materials has to be made very far in advance but, in many other industries they have to be arranged for sometimes a year or two or even three years in advance and sometimes you need to be a crystal gazer to know what you should buy. We have all varieties in between and any mistakes in a long term inventory can be severe. The shorter period ahead which you have to provide raw material, the less chance there is of making a substantia l error. I think that point might be emphasized in connection with the action on the part of management and the fact that the speed with which they reduce inventories can defeat this action and hinder their desire to build stability.

Now we will go on to the next question and I think it is a most interesting one. It is in a way close to the hearts of everyone. It is: What action should management take, if volume cannot be maintained, with respect to reduction in labour force? I am going to call on Mr. Griffenhagen to start the discussion on that question.

E. O. Griffenhagen—All I will attempt to do is frame a list of questions and leave it to the members of the Panel to answer them. I have several. Should the cuts be gradual or sudden, that is, similar to taking off the dog's tail in one bite or in several? If they are gradual should they be continuous or spaced, so that at least for an interval everyone may have a measure of security Should it be done in hours and rates of pay? How can cuts in hours which provide a sharing of the work be modified by a preliminary weeding out of the unfit?

How can cuts in numbers be reduced by transfers to other activities that perhaps have been waiting and that could be made to serve a useful purpose during a period of a lull in business activities in the nature of an investment to pay dividends when business activities pick up?

If rates can be reduced should they be reduced in horizontal cuts and uniform percentages; or should this whole opportunity be seized upon as a heaven-sent chance to eliminate inequalities, of which there are always so many, on the argument that you can cut some and not others, and you can improve some of the relationships that are so disturbing to morale and so contrary to equity?

G. Blair Gordon—I think I will only try to tackle one of the points, the question of reduction of working hours or the working force, whether it should be done by way of a shorter week or by taking so many names off the payroll. Perhaps I can only put the thing in this way, that to spread the impact of the reduction in working force, if you do it by hours, of course, nobody loses a job. But on the other hand, looking at it from the industry's angle, you are in danger, I think, of losing some of your best employees, the more ambitious and aggressive ones, if they can go elsewhere and continue to get full-time employment. They know what the policy of the company is and why it is running on short time. Frankly, I don't know the answer to that.

I suppose what you'd do in the first place would be to try and reduce hours a bit and if you don't begin to lose your help and if everybody else does the same thing, if there is nowhere else for your people to look for a change in their situation, you are all right. You still have your working force ready for the first upswing in business, which is not the case if you lay people off completely and keep only a nucleus of a reduced working force and in that case you usually have trouble picking up those people again if you need them.

The practical approach, I think, is that first of all you have to introduce a reduction in hours of work and see what happens. If the first thing is wrong and you lose your people, then you may have to change your mind.

E. M. Little—I should think that as we are just coming out of a period of nine years of war-stimulated economy where there have been large demands for increasing production of commodities and concurrently the expansion of plants to meet those demands in practically all industries in this country, we have inflated staffs because of that and there must be misfits in the organizations.

We shall continue to say that organization management must be careful in its action about creating unemployment but the suggestion that I am making now for the others on the Panel to discuss is this: Is it not necessary, regardless of whether it is going to create unemployment or not, that some reduction of personnel is necessary to get our business down on a proper peace-time level?

Because of that inflation of staff are we facing unemployment which we ourselves will create; and if we decide that some must be laid off, how severe is that action going to be? If it is too severe we are bringing about a condition whereby we reduce the purchasing power — might even bring about a panic — and in the long run that is going to hurt our business and our profits.

McNeely DuBose — I am convinced, if we are having such a recession in demand that we must have a recession in output, it is just plain foolishness to think that the best thing is to keep everybody employed. First the misfits and the floaters should be let out. It is a fact that due to labour inefficiency in the boom period we have required more men than ordinarily necessary to do the job. Those things must be levelled off and efficiency restored. That is the one compensation for depression but how to do it without contributing strongly to the slump, is the question. History has shown that it is largely the fear of inability to purchase which has caused the rapid depressions we have had.

E. M. Little—May I ask a question? Is your point that if reduction in labour force is necessary then you can soften the blow? To what degree?

McNeely DuBose—I think the reduction of labour force to efficient size could be controlled so as not to spread fear in the hearts of all the people. It might create fear in the comparatively small percentage of floaters and misfits that would be laid off but the danger to be avoided is that all the other employees, if they don't know what is in the minds of the managers, would think that is just the beginning and that soon, they too would be out of a job. So they all will start to husband their money and then we are really into a slump.

I believe we should trim down to a good efficient business basis, but I think it is extremely important to tell all employees, and the people at large, just exactly what we have in our minds. I think also that we should tell the remainder of the employees right at the start that, as long as we are able to do it, they will all be kept on. Their hours may be reduced, they may have to do this job and that job to fill in the best way they can, but they are not going to be thrown out, as long as they want to stay and play ball. They are members of the family, so to speak, and they are regarded as such. The dangerous sort of fear is not the fear of having to tighten the belt, it is the fear of destitution. That is the type of fear that gets out of control. If a man has the assurance that the whole "family" is sticking together and that he, individually, is going to be able to provide for his family that will be a tremendous aid to his morale and will have a considerable effect on improving his purchasing power, and, in that way, do a lot to avoid the so-called vicious circle of increasing depressions.

E. M. Little—There are two main aspects in this labour thing that I hope the panel discussion will bring out. The manager has to decide these two questions. One is the size of the labour force or reduction in personnel and the other is what your policy is going to be about wages. I should think they are of equal importance. To my mind the labour problem in a business recession resolves itself on these two points. Mr. Barriger, would you care to comment on both aspects of this matter?

J. W. Barriger—I think you have reference to the fact that in our balanced economy one company's or person's cost is another's income. What might be an extravagance for and for my company is the livelihood of some one else. What is an item of expense in one place is an item of income in another. We must be certain that in the reduction of expenses we must not reduce purchasing power faster than we reduce costs.

When nations worked under the uncontrolled laissez faire economic conditions of pre-New Deal days, natural readjustments came quickly after depressions began and built up purchasing power through decreased expenses and costs much faster than it was destroyed in other places through concurrent downward readjustments. In our attempts to inject artificial elements of security into the situation in the Thirties, the readjusment was made more difficult and prolonged.

In the past, the initial readjustments have usually been taken by labour, through wage reductions and force reductions or both. Costs were thereby brought down sufficiently to re-establish purchasing power which enabled business to go forward. Now labour organizations, reinforced by political power, make wages very difficult to reduce and labour forces are held at greater numbers than necessary by feather bedding practices.

I hope that we are not going to find that the purchasing power of the individual is contracted by an unbalanced relationship between wages and prices and employment. The various factors of readjustment in prices and wages and in total level of employment must be co-ordinated to preserve the purchasing power of the nation in terms of physical units of output.

Actually I think that if the current readjustment is handled with the best managerial skill, which all the preliminary thought that has been given to it should ensure that it will be: we will find ourselves following the procedures of the classical laissez faire economy in the United States and Canada. If so, these readjustments will quickly build up a greater national purchasing power in terms of goods than we actually had before the readjustments were made.

I think that, as long as we hold these economic readjustments in line with normal competitive factors and avoid deflationary tendencies evidenced by involuntary liquidation of asets, there will soon come a day when we will find that purchasing power, has been built up and not lost through these processes.

E. M. Little—Mr. Bowditch, I would like to ask your opinion on a certain thing that is happening. Generally speaking, labour unions by and large are at present undecided in their demands in many industries. They are either waiting for certain wage increases in the United States or on the other hand they are wondering whether the trend will be definitely downward and at what rate. If it is the latter point, if they are waiting to determine the trend and realize that they cannot buck the trend for any period of time, it seem to me that labour by and large is trying to build up a certain stability for labour and that we are trying to build into profit levels.

What do you think management's policies with respect to wages during a depression period or in any wage reductions that have to come along should be? Say a plant has been producing beyond its normal capacity and beyond the normal capacity of the country to consume. In that reduction of output there is a reduction of working time, so that if we are not careful in reducing wages, then we might bring about an acceleration in deflationary tendencies such as we have been talking about.

R. L. Bowditch—I think management, if at all possible, ought to go slowly on wage cuts. It should be an orderly procedure. It should be tied in with the cost of living. I think that phase of it can be very much more explored by management than has already been done by management. I believe most labour leaders and unions want stability just as much as management does and probably more than many investors do, but fully as much as management does.

There is one phase of this situation, however, on which I would like to speak, if I may have your permission, and I will ask those present to forgive me for using my own industry as an illustration. A great many industries can and should have an orderly procedure planned if, as and when they have to cut their labour forces. In doing that they should cut the misfits first and those that were put on for wartime peak purposes, the floaters, as Mr. DuBose said. At the same time we must realize that we have a problem confronting us in that we have a population increase in the United States alone of nearly 3,000,000 persons per year. You are going to have a labour situation created by that. True, you will also have a consumer situation and a purchasing situation created by that and these things must be correlated.

As Professor Schell told us this noon, we are dealing and should be dealing, and thinking and should be thinking on a world-wide basis. This industry that I happen to be in—really I am in two, the steamship and the coal industries, and when I am not in hot water with one I am in hot water with the other—is going to take a licking from the world-wide oil industry. As I stated at the outset, the Near East oil industries are producing a lot of oil which is replacing the Venezuelan oil which has been going to Europe. That means South American oil comes up to the place which is most vulnerable, viz, the Northern Atlantic coast of North America.

I listened to a United States Senate hearing only a year ago wherein the oil industry stated emphatically that never again would oil be used for primary power purposes in competing with coal. They did not even know the answers that would come up within one year. Here my own good company is losing overnight because of an economic trend, well over 1,500,000 tons of coal in the New England states alone. There we do not have time to have an orderly recession. We have to see what we can do quickly if we are to retrieve the situation for the workers.

Now if we have another "holiday" and if we go along the line of spreading the work and reducing the time, up goes the cost, because the coal market has already gone down. It may be that the time when there must be a definite change is here. It may be that my company, along with a lot of other companies, will have to seek other means of employment for these people that have been with us for many years, and we are seeking that today. We think we have an answer. But—we have got to take care of those who have been with us for 30 years who overnight may find themselves without a job.

E. M. Little—I took this occasion to ask Mr. Bowditch to answer that question because we have just decided to switch to oil.

R. L. Bowditch—If you won't tell John Barriger I will tell you that we are thinking of going into the oil business in a big way.

E. M. Little—Now ladies and gentlemen, we have come to the end of the prepared discussion by the Panel.

McNeely DuBose—I was speaking very glibly a moment ago about weeding out the misfits and the floaters, etc. I was talking from the point of view of management, and something makes me think I should express a word of caution. For the past couple of days we have been listening to many ideas on scientific management. We know a lot about it. Pretty soon we are going to be able to say "This man is a misfit" and "that man is so-and-so" without any uncertainty at all. We know what it is all about but we must pause and consider the impact of all this on the people at large.

Is scientific management going to become so scientific that it pompously takes over a responsibility that used to be left to nature? I just want to remark that we must not become so scientific that we forget the human side of the reaction of the public against acts of supreme command, no matter how well justified. We can accomplish what we want in all of these things just as well and far more safely by doing them through channels based on the idea of presenting them in a co-operative rather than an arbitrary manner. I think every one knows what I mean.

E. O. Griffenhagen — I might make the comment that I heard one of the best papers that I have ever heard by an officer of a utility in California some weeks ago in which he discussed the subject of Merit vs. Seniority and Promotion, a small subject but with a big principle. It was interesting to me. He said you must always weigh the effect on the individual which would be sharp and complete in such an action as a lay-off; or a promotion, which might be apparently to the advantage of the company, because you bring the best man up and drop the poorest man out, to the lesser effect on the larger number, or its entire labour force. It is a fine point that requires skilled judgment.

E. M. Little—Again, we must not let that get to the level of the vice-presidents and the presidents. I would like to make a few comments on the panel discussion and also on the discussion we had this morning.

There are two main schools of thought as to what management's policy should be when entering a post-boom period. One is to do planning so as to get the trouble over fast and the other is to keep some semblance of order and stability and make the change as gradually as possible. Some of the gentlemen on the Panel it had not been my pleasure to meet before, but it is remarkable that in all the outstanding points of the discussion there was a fairly unanimous approval of trying to moderate the change as much as possible and through the adoption of management policies try to maintain as much stability and as large a degree of order as possible in meeting this decline.

I think there is general recognition of the fact that if business is going down, individually or collectively industry cannot stop the decline but it is felt that something can be done about the rate and degree of recession.

Another point was mentioned this morning, that on the upswing, in a period of rising business, management has striven, and I think will on the next one, too, to try and keep wages level, from getting inordinately high, and by the same token will try and see on the way down that we do not accelerate the unemployment situation, the idea being to build a stability factor in any period, whether it be one of decline or one of rise.

If I may now, I would like to take these questions from the floor and I will ask the members of the Panel to comment on them. The first one is: Since it is possible that the misguided actions of very few members of management, by erratic price cuts or boosts, under our competitive structure, result in a general instability of prices, what provisions should be made to protect the actions of the very few in order not to cause a stampede of many?

E. M. Little—The only thing I can think of is the Sherman Anti-Trust Act in the United States and the Combines Act in Canada.

McNeely DuBose — You cannot control it. But if it is only a few men, that fact should be advertised by the others. That will take a large part of the curse off it, and it will die of its own accord.

G. Blair Gordon—Of course it is your customer who brings it home to you. Somebody cuts a price and somebody buys cheaper and whether you can withstand that thing becomes very doubtful, in my mind. Once it starts it is doomed.

R. L. Bowditch—Mr. Chairman, don't you think that management should be schooled in not jumping at rumours, not to believe the first rumour that is handed out by the first purchasing agent who sees you; he may be trying to get your price down by any means he has at his disposal, and also don't jump when the first order is taken. I would be sure that we are right before we act.

E. M. Little—We should keep sales policies out of the hands of our salesmen.

E. O. Griffenhagen—The only answer to that is to run your business so well in good times, that in times that are not so good you can weather it out while the other fellow goes broke.

J. W. Barriger—This question relates to involuntary and disorderly liquidation on a large scale. The present financial situation does not create any serious likelihood of such unfortunate developments. I think the conditions of which he speaks are a remote danger.

E. M. Little—No, his question is very specific. (He repeated the first question as above.)

J. W. Barriger—One or two managers could not bring that about because there would be sufficient demand to absorb any rash and impetuous liquidation. Let us suppose, for example, that a person in any line of business might have a selfish interest in producing a chaotic price situation and wanted arbitrarily to bring it about by some fantastic price cuts that represented a "bear raid" on the market to break quotations. Don't you think there is enough pent-up demand to absorb it? It takes a very much more extensively organized action than could be brought about by any one or two firms, even if they were the large ones. Moreover, the bigger they are the more they have to lose by that kind of process. It is not a business situation I have described but speculative manipulation. The person who would do that would be looking for his profits not from a business operation but from gains from a successful short sale. There is seldom a time when the manager of a large and responsible business has any opportunity to make money for his company by such manoeuvres. I think the question concerns a condition which does not exist to any considerable extent. A small company might be able to do it but it would be suicide for a big one to try. The answer is Do nothing about it and let the bear raider go broke.

E. M. Little—This discussion is also in line with another question: How can management hold their ranks in opposition to department store buying and selling?

I think the answer is that if the management of large organizations follow a sensible pricing policy when industry is going down they will be all right.

Here is another question from the floor: large companies claim that the prices of their products do not leave any margin in them for investment capital. They go outside for this. What is fair to the public?

McNeely DuBose — Probably that question is in reference to something I said. "Can business go out to the public in recent years and get money for expansion?" I believe that people who have been trying to raise investment capital, particularly if they want any large quantity of it, are finding it difficult and it is becoming more and more so.

Delegate—I happen to know that the Bell Telephone Co. is one instance. One of their officials told me that was the case in their company.

E. M. Little—That is along the lines of a question that we wanted to cover but we decided there was not time to discuss it. We have not the answer for that.

Here is a question very much to the point, I think: It has been suggested by the Panel that extra sales effort should be made to persuade people to buy when they are holding out, fearing a depression. Is this honest? Does not industry itself hold out on buying machinery at such times to keep its capital liquid?

McNeely DuBose — The fourth question we had for discussion was on company purchases, principally purchases of raw and expendable materials. The answer needed was to what extent should industry hold off buying? As we discussed it, I believe that the consensus of opinion was that you could not expect companies to keep on buying at the same rate as they would if they were sure there would not be the same market for their products. But reductions in buying should not be precipitous.

E. O. Griffenhagen—The implication was that you were holding out because you thought you could get it later.

McNeely DuBose — There are limits on how far you can go. Management must answer that question for itself. The customer has the same rights exactly. Nobody questions that, but management has a much greater individual responsibility because its single action affects so many.

R. L. Bowditch—Down in my section of the States we have been hearing, " We may have a recession in 1946 "; " or 1947, or 1948 ". Now they are saying " It will come in 1949 ". I don't think it is necessarily yet. If the Press, and the Press is all-powerful, would come out and talk about some of the good things, the new industries that have been created in our section, for instance, as much as they do about the people who have been laid off, I think it might help to change the psychology of the thinking, and people can think themselves into a depression awfully fast.

I don't think it is possible to over-stress that and while it does not tie into exactly what we are saying it does relate to the general subject.

E. O. Griffenhagen—Of course the papers print the news.

R. L. Bowditch—We have been badgered by the newspapers talking about the movement of the textile industry to the South and at the same time we have had 400 little new industries opening up during the last year. I would like to see that talked up.

E. M. Little—I think that question raised here is quite good, on the matter of pricing policies and inventory reductions, and the implication is that everybody is hoping that everybody else may be slow in reducing his inventory while he goes at it fast and possibly gets the income advantage. All our actions are tempered by the fact that we can't pull ourselves up by the bootstraps. We have to compromise with what we feel to be right all the way along in management. We have to take our share of the responsibility for our own actions be they good or bad.

G. Blair Gordon—I may have been responsible for that question having been asked, because of my remark about having to maintain sales efforts or make a more extraordinary type of goods in a period when demand was falling off. I don't know that it is entirely analogous to a company that is cutting down on its purchases. The point I was trying to make was that the money was going to be spent. The consumer has so many dollars, perhaps even in less prosperous times, that he is going to spend. If the manufacturer is to get his share of it he has to make a special effort, otherwise the consumer is going to spend it less wisely than we had hoped.

E. M. Little — I don't know whether we are giving anybody the answers to any of these questions, even the first five that we discussed. Here's another: Why not direct research to production of necessities during post-boom period? For example, towards production of boots rather than production of cars?

E. O. Griffenhagen—That is a social, political question. If we had a controlled state people would do that. Do we want to do that?

E. M. Little—Is it not true that when you are looking for sales you not only want to produce all the boots that you can but all the cars as well?

E. O. Griffenhagen—If you are set up for car production how can you switch to producing boots? All you could see would be a measure of the demand, which would be a different index of what people want, what makes them happy.

E. M. Little—There is one more question here. I am not so sure that I see where it fits in. It refers to sales efforts and merchandising costs and discounts. Merchandising take of the consumer's dollar seems to be out of proportion to labour's and owner's or manufacturer's take. Yet a manufacturer in search of extending or holding his volume of sales is rewarded by giving the merchandiser the discount that will ensure his sales concentration on his product. The fewer consumers' dollars available, the more this trend.

I take it that refers somewhat to the middleman whose compensation for his sales efforts depend on the rules of the game and the efforts he makes.

McNeely DuBose—I heard it stated at a talk some years ago, I think at the Advertising Club of Montreal, that of the price the consumer paid for an article, only a small part was the manufacturer's cost, and the rest of it went to middlemen, transportation, and a great many other places including tax collectors. I think the speaker said that overhead was one of the large items, and the percentages he gave were a bit of a shock. I don't know whether anything can be done about it or not. I presume it is necessary in general for those things to occur, otherwise nature would have eliminated them.

E. O. Griffenhagen — We could talk for years about the high cost of distribution. I agree with Mr. DuBose that it takes care of itself. If it were not necessary to have these agencies, they would soon disappear and these costs would disappear.

E. M. Little—I think one suggestion might be thrown out here. It would be a good idea if you put all agents, middlemen, etc., instead of on a commission, on a somewhat larger share of the net profits of the corporation. It is true that during a period of a buyer's market orders and sales efforts are much more pronounced than in a period such as we are just coming out of and rather than paying them too little in the period just ahead we have probably paid them too much in the period just ended.

Delegate—What about the expense of fringe benefits, I mean such things as pensions, life insurance, etc.? That amounts to something like 10% or 11% of the payroll. If you operate on short time those costs of fringe benefits don't alter very much. They are fixed. Therefore if you don't keep on your maximum number of employees your fringe benefits may become 15%. Is that not going to have an effect on the policy?

E. M. Little—That subject of social benefits is something that we felt was the outcome of our ruling on these policies that we talked about. It is pretty difficult in a period of this length to cover all of the phases of a subject as important as this. I don't think any of the people on the Panel thinks he is getting the answers to anything. There is no doubt that the cost is pretty high. It is just a question of any or all of these fringe benefits that you accept, particularly if the decline gets serious.

McNeely DuBose—This is just the time that it would not be wise to try to explain that some fringe benefits might be wiped out by a sufficiently serious depression. That would make the public morale just so much worse and tend more to depression.

E. M. Little—I think our time is up, ladies and gentlemen, and I want to thank you for your attention. I want also to thank the members of the Panel for the time and work they have contributed to this session.

Keynote Session

(Continued from page 628)

pour le C.I.O.S. de recevoir dès maintenant le stimulus, l'appui et la collaboration constructive du Canadian Management Council qui apportera à notre oeuvre commune des contributions intellectuelles, techniques et pratiques d'une si haute valeur. A preuve, la conférence actuelle et son programme si riche, si bien choisi et si hautement à la page.

At this point let me turn back to English and make final remarks on the programme of this conference. On Saturday afternoon we shall have a panel-discussion on "Management Policies in a Post-boom Period". The Second World War brought a second post-war boom period, similar to the ominous millennium of the twenties after the First World War. This second post-war boom period is now inexorably followed by a post-post-war boom period. But we have good reason to believe and to trust, that this post-boom period, which this conference will discuss tomorrow, will not be similar at all in extent and intensity to that which set in after the first war in 1920 and developed into what was a real crisis, the greatest depression of all times.

Your programme calls the present situation in a very matter of fact manner a "post-boom period" which asks for appropriate management policies. In *Punch*, I read recently the much more elaborate designation—"redisinflatory cut-back to normal prices". While the black word Crisis is wisely banished, the present situation brings authors to digging up some of the slogans and jokes heard and read after 1920. One of them has reappeared in several periodicals and it runs as follows:

> "A recession is a time when you have to tighten your belt.
> A depression is when you no longer have any belt to tighten.
> And, when you lose your pants too, that's panic."

Now, if industry does not lose its pants this time and not even its belt, it is because we are prepared to use, in this most important process of tightening the belt, the best possible policies of planning,—the principles and methods of organization and scientific management.

Human Engineering in Management

(Continued from page 635)

housework for even a short time and you will soon find modern improvements in the house.

Thinking Spans Boundaries of Nations and of Science

May I just supplement these few remarks on co-operative effort with some which will perhaps have more dignity if not more interest? There are many engineering projects dealt with at the Mellon Institute. Industrial hygiene people of all types, and business people, have come together there to discuss certain projects. Dr. Juran could tell you much more about that than I. There was a project that the New York University College of Engineering, Graduate and Research Divisions, set up last winter on industrial fatigue, with the psychologists and the anthropometric people, where they studied the problem of people in industry getting unnecessarily tired, and other matters of industrial engineering.

Then I want to bring to your attention this marvellous new book in the field of cybernetics. I know it means control. It has to do with the human element and the machine element. The author tells us that we can probably do everything by machine if we want to and I know he presents a wonderful picture, almost a complete assembly line without a human element at all. What he said frightened me rather, but he presently reassured me as to the type of people who are working in this field. They really are people who care about this human element, people whose only interest is in doing some sort of thing which may help to free us all for more creative activities; above all, people who represent a great diversity of disciplines.

As Mr. Maynard said to us this morning, we are beginning to think across national boundaries in this management field. If this is true, I think I can go a little farther and say that we are beginning to think across boundaries of science in the same way, and if the groups who follow have the same feeling, that the human element is important, that the engineers who have made such wonderful contributions in other fields have their part to play in this work, then I am sure we can all go forward with courage to meet the challenge with which we are faced today, to make our world into a world of peace.

Planning and Unified Management of Industrial Apprenticeship in Brazil

(Continued from page 630)

poses. It has trained many hundreds of thousands of foremen and supervisors throughout the United States. After the war it spread throughout many countries, and quite recently the International Labor Office at Geneva has taken it up and is spreading this system especially over countries whose industrial development was tardy. I would suggest that you get in touch with the famous Mr. Dooley, the father of T.W.I. in New York.

M. E. Alvaro—During the war Professor Manja, who is an engineer and a professor of an engineering school, the University of Sao Paulo, was sent to the United States precisely to study these streamlined methods that were being used. Many of the ideas he saw in the United States are being used in the apprenticeship services which are under his guidance.

J. E. Dion[4]—Did you in this service of yours give any training or education, any indoctrination that these people practice in industry, teach them the principles and responsibility in the economy of industry? Do you give them a broad picture?

M. E. Alvaro—They are indoctrinated as to what they can demand. Of course, so far they have not established a gradation of the salaries in the different trades and informed the boys about the possibilities. They are more or less organizing the trade.

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[4] Consulting management engineer, Montreal.

From Month To Month

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

The Fourth World Power Conference

The Fourth World Power Conference will be held in London, England, July 10-15, 1950, under the auspices of the British National Committee. Their Royal Highnesses The Princess Elizabeth and the Duke of Edinburgh have graciously consented to be joint patrons.

The theme of the Conference will be "World Energy Resources and the Production of Power" and the technical programme will consist of three divisions as follows: energy resources and power developments; preparation of fuels; production of power.

The programme and papers committee reports that there are already 136 papers in course of preparation. The Canadian Committee has arranged for presentation of papers as follows:

Division I — Energy Resources and Power Developments in Canada — by Dominion Water and Power Bureau, Geological Survey of Canada, Dominion Bureau of Statistics.

Division II — Canadian Coals, Their Production and Preparation —by Fuels Division, Department of Mines & Resources.

Division III — Generation of Hydro-Electric Power in Canada — by Dr. Otto Holden, M.E.I.C., assistant general manager — engineering, The Hydro-Electric Power Commission of Ontario; W. R. Way, M.E.I.C., general superintendent, The Shawinigan Water and Power Co.; and E. V. Leipoldt, M.E.I.C., vice-president. Shawinigan Engineering Company.

Technical sessions will be held in the buildings of the Institutions of Civil, Mechanical, and Electrical Engineers. There will be a full programme of social events and a programme for ladies accompanying the delegates. Following the conference there will be a series of alternative study tours to installations and factories of special interest in different parts of Great Britain. Messrs. Thos. Cook & Son Ltd., are official travel and hotel agents for the Conference. Their Canadian offices are at 1241 Peel St., Montreal 2. The Conference occurs at the absolute peak of the travel season and prospective delegates should make travel and hotel reservations at the earliest possible date.

Further details may be secured from the honorary secretary of the Canadian Committee, Norman Marr, M.E.I.C., Laurentian Building, 54 Albert St., Ottawa.

The First Panamerican Engineering Congress

The First Panamerican Engineering Congress, promoted by the South American Union of Engineering Associations (U.S.A.I.), in co-operation with the American engineering societies, met at Quitandinha, Rio de Janeiro, from July 15 to 24, to discuss engineering and engineering educational matters, and problems particularly affecting the American continent.

Members comprised official members, representatives designated by certain American nations, delegates appointed by engineering societies of the various countries, active members registered at the convention, representatives of associations, corporations and firms contributing technically and financially to the Congress, and correspondent members—distant technicians and industrialists.

The Rio Congress was preceded by preliminary meetings at Sao Paulo, from July 9 to 12, formally opened at the Municipal Theatre, Sao Paulo, and the sixth convention of the U.S.A.I. These preliminary meetings were taken up in election of officers, study of the Congress programme, and discussion of proposed general regulations of the Congress and statutes for U.P.A.D.I. (Panamerican Union of Engineers Associations).

The Congress proceeded to Rio, stopping at Volta Redona to visit the steel works. It was formally opened at the Municipal Theatre, Rio, and the president's speech was noteworthy, and might well be published in the *Journal* with advantage.

The work of the Congress consisted in the study and classification for nine committees of various papers, reports and recommendations, and publication in the Congress annuals: Transportation and Communications, Construction, Energy, Urban Engineering, Sanitary Engineering, Industrial Engineering, Mining and Geological Engineering, Teaching of Engineering, Miscellaneous.

I attended the meeting of the Energy Committee, was proposed for vice-chairman of that committee and the Transportation and Communications Committee, but had to refuse on account of business appointments.

The various committees submitted their recommendations at the various plenary meetings to be put to general vote. Some of the discussions were very heated and prolonged. At the first plenary meeting, a resolution was passed unanimously that all members undertake to work for promotion of the greatest friendship, understanding, harmony, and co-operation among the peoples of America and to create a Panamerican Union by individual and collective effort.

Other sessions considered: international organization and co-operation in the profession; simplification of consular services to facilitate commercial, cultural and social interchange among the American Nations; improvement in postal and rail services; river transportation in South America; mineral resources and sources of energy in the Americas; management-labour relations; standards and standardization of technical rules.

One important recommendation was made that engineers should participate actively in the political affairs of their countries.

In addition to the regular plenary meetings, a very interesting exhibition of Brazilian engineering works was held in the hotel. Films were shown also on a wide variety of equipment, industries, products and services.

A special meeting was held to discuss the foundation of a Panamerican association for the development of electrical engineering applications.

In addition to the technical and other discussions, arrangements had been made for visits to most of the points of engineering interest in the area. The social arrangements were highly successful and were climaxed by a ball at the Quitandinha Hotel. As the Canadian delegate, I also attended a lunch given by the embassy of Uruguay and one given by the ambassador to Cuba.

Although I was unable, due to pressure of business, to attend all the meetings and visits I would have wished, I formed impressions of the genuinely friendly spirit of the Congress, and of a very evident desire on the part of all members to co-operate and collaborate to the maximum.

My personal pleasure in meeting several first class engineers, strongly conscious of their importance in the life of their own countries and of the contribution engineering has made and will be required to make further to their country's welfare and to continental safety and progress.

I found a not-too-evident realization of the urgency of international affairs. In my view, greater efforts should have been made to co-ordinate relevant information which will be clearly of value in a comparatively short time in the interests of continental safety, and wellbeing.

To reap the maximum benefits from such a Congress a team of experienced men is required, each a specialist in one or more lines. All the nine committees met simultaneously.

Many men talked far too long, and to little purpose.

The precise mechanisms for implementation of important recommendations should have been laid down, and an attempt made to establish authorization for the new associations with the governments of the different countries.

The difficulty of financing some of the continuing associations so that they can operate effectively still remained unsolved, so far as I recall.

On the principle that everyone's business in certain respects will be Canada's in the near future, I recommend for serious study by the Government of Canada, the entire data collected at this Congress. It would be possible to obtain much of this directly from Dr. Brito, and it will be some time before the proceedings are published.

I am forwarding Dr. Brito's speech, several photographs taken at the Congress and views that may be of interest to the Institute, together with a number of publications obtained at the Congress.

G. J. T. Gunn, M.E.I.C.,

Canadian Delegate representing the Engineering Institute of Canada.

Nominees for Office

The report of the Nominating Committee, as accepted by Council at the meeting held on September 23rd, 1949, is published herewith for the information of all corporate members as required by sections 19 and 40 of the by-laws:

President: James A. Vance, Woodstock, Ont.

Vice-Presidents:

*Zone "B" (Prov. of Ont.)	Drummond Giles	Cornwall
*Zone "C" (Prov. of Que.)	J. F. Wickenden	Three Rivers
*Zone "D" (Maritime Provs.)	E. O. Turner	Fredericton

Councillors:

†Newfoundland Branch	Name to be submitted later.	
†Cape Breton Branch	C. M. Smyth	Sydney
†Halifax Branch	W. C. Risley	Halifax
†Moncton Branch	R. L. Parsons	Moncton
†Quebec Branch	J. O. Martineau	Quebec
‡Montreal Branch	J. P. Carriere	Montreal
	L. A. Duchastel	Montreal
	I. R. Tait	Montreal
†Cornwall Branch	D. Ross-Ross	Cornwall
†Ottawa Branch	A. A. Swinnerton	Ottawa
†Peterborough Branch	F. R. Pope	Peterborough
§Toronto Branch	J. F. MacLaren	Toronto
†Niagara Peninsula Branch	P. E. Buss	Thorold
†Hamilton Branch	W. E. Brown	Hamilton
†Kitchener Branch	Name to be submitted later.	
†Sarnia Branch	F. F. Dyer	Sarnia
†Sault Ste. Marie Branch	L. R. Brown	Sault Ste. Marie
†Winnipeg Branch	T. H. Kirby	Winnipeg
†Calgary Branch	R. T. Hollies	Calgary
†Lethbridge Branch	A. G. Donaldson	Lethbridge
†Central British Columbia Branch	H. L. Hayne	Kamloops
†Victoria Branch	R. C. Farrow	Victoria

* One vice-president to be elected for two years.
† One councillor to be elected for two years.
§ One councillor to be elected for three years.
‡ Three councillors to be elected for three years each.

Correspondence

CORPORATION OF PROFESSIONAL ENGINEERS OF QUEBEC

September 19, 1949

The Editor:

I would like to offer a few comments regarding the article in the August number of *The Engineering Journal* entitled "More Figures on Salaries and Employment of Young Engineers" published on pages 478-479.

It is apparent that the Corporation's Report of the 1948 Survey of Engineers' Salary has been misunderstood or misinterpreted with the result that part of your article creates an erroneous impression.

Table III and the last paragraph of the article refer to the "Actual Minimum" and "Recommended Minimum" salary for graduate engineers having (a) no experience and (b) 10 years of experience, obtained from our Report recently published, and compare these with the minimum figures from the recent report of the Engineers Joint Council of the United States.

There is no basis for comparison, and there is no way of determining from the Corporation's Report what is the salary, minimum actual or recommended, for any given number of years of experience. It was a deliberate intention of this Report to avoid any such figures because early in the survey they were found to be without significance in themselves alone, and although possibly interesting statistically, of little value for the purpose of the Report.

The salary figures of $473.00 and $520.00 published in the *Journal* for graduates with 10 years of experience might be said to be the actual minimum and the recommended minimum salary respectively for graduate engineers who are actually holding positions of greater responsibility than that defined as grade V and less than that defined as grade VI, and requiring a greater minimum length of experience than the minimum of 9 years of applicable experience required to qualify for grade V. These salary figures do not in any way indicate the actual minimum or the recommended minimum salary for engineers having 10 years of experience.

Table I of the Corporation's Report gives a figure of $471.00 per month as the "average minimum salary" for positions (not individuals) for which the *minimum* qualifications are graduation in engineering plus *at least* 10 years of applicable experience. Table 14 of the Corporation's Report is a "Comparison on Basis of Years of Experience", and gives a figure of 1.39 dollars per month per evaluation point for all positions requiring at least 10 years of experience and 1.41 dollars per month per point for all individuals having 10 years of experience. These were calculated from the total evaluation points (education, experience and responsibility) of all positions for which the minimum qualifying experience was 10 years and of all individuals whose actual experience was 10 years. There is no way of translating these figures into dollars per month without knowing their average grade of responsibility. Therefore, neither of these tables gives any clue as to the minimum salary either actual or recommended on the basis of years of experience alone.

The impression created by the article of the *Journal* is unfavourable to our recommendations, as it indicates without foundation, (a) that we recommend minimum salaries greatly in excess of the comparable American minima and (b) that we base our recommendations on years of experience. As even the author of our Report is unable to state without considerable research into unpublished data what the minimum salary for engineers with 10 years experience is or should be in Canada, it would be very much appreciated if you could take the necessary steps to have this impression corrected in the next issue of *The Engineering Journal.*

Your co-operation in this matter would be highly appreciated.

LEOPOLD NADEAU, P. ENG.,
Registrar.

September 18, 1949

Mr. Perry's paper in the August *Journal* is very sound and stimulates prairie dwellers to thoughts of what can be done to improve matters, for we are keenly conscious of the narrow margin between a plentiful crop and near famine.

Anyone who has travelled from the south of Alberta northward, say to Athabaska, has noted the gradual change from bare prairie to solid tree growth. Until he examines the rainfall records, it appears that he is going into progressively increasing rainfall, but the records over the years tell him that the rainfall is not materially greater in the north than in the south, and the difference in moisture is a matter of northward decrease in temperature and evaporation.

Mr. Perry, perhaps wisely, avoids suggesting quantitative data on evaporation. We, perhaps unwisely, make comment. It might be valid to suggest water vapour pressure as one criterion. Using Perry's Fig. III, Calgary, with mean annual temperature of 38 deg. should have a mean water vapour pressure of 5.82 mm. of mercury. Athabaska, with mean annual temperature of 33 deg. should have vapour pressure of 4.75 and the evaporation rate might be 82 per cent as great as at Calgary, *other things being equal.*

But other things affecting evaporation are not equal in every locality. Some of them can be controlled, at least in part.

Supply of ground water to the ground surface depends on capillary forces. The dry land farmer tries to break capillary movement upward by cultivation and by working fibre into the soil.

Rate of change of air over the surface from which evaporation proceeds, and particularly within a thin layer close to the surface, has a profound effect on rate of evaporation. One is inclined to say that this is only equivalent to making wind velocity and frequency the criterion, a matter over which man has no control, but note this incident:

Some years ago, an evaporation pan was placed in the yard of a farmer in southern Alberta, and he undertook to keep evaporation records. Whether from pride in being asked to participate in research or merely to protect and beautify his place, he planted a row of trees around the border of the yard. Ten or eleven years later, I had occasion to need evaporation records and inspected the surroundings and the records he had obtained. By this time the trees formed quite a solid shelter and the records, when compared with those of other less sheltered pans, indicated to me a graphic and gradual decrease in rate of evaporation with tree growth. The exact amount was not possible to evaluate, but I felt it was enough to make a material difference in humidity in the soil of the yard.

Soil drifting is a threat to agriculture and a means of checking it is strip farming. Narrow strips of grain alternate with strips of fallow, the long dimension being at right angles with the prevailing winds. This type of culture has been very effective in checking drift. If it is effective against soil drift, it must have an appreciable effect on evaporation.

So much for things man can do to check evaporation, but what of matters over which he has no control?

Meteorological records coupled with observed recession of mountain glaciers indicate a general increase in mean annual temperature over western Canada. Whether this tendency is general over the northern hemisphere we are not aware. Is this increase likely to be progressive? Its quantity is of the order of 4 or 5 deg. F. over the past 50 years, sufficient to call for an increase of 20 per cent in rainfall to give equal soil moisture.

Geologists tell us that in Pleistocene time there were at least two, perhaps three advances of glacial ice in Canada, with recessions between. Farther south as many as five advances have been postulated, although there is reasonable doubt as to the exact number. At its peak of glaciation, it is estimated that enough water was accumulated as ice to cause a lowering of sea level of 200 to 300 feet, and the weight of the ice cap caused isostatic depression of the earth's crust of the order of several hundred feet. The advance of the ice sheet, which in this continent reached Kansas, is known to have driven primitive man in northern Europe southward to the Mediterranean. Its accumulation can be accounted for only by a decrease in solar radiation. A shift in the earth's axis might account for the location of the ice cap, but could scarcely account for the great accumulation.

The retreats of the ice between advances can also best be accounted for by increases in solar radiation. Ernst Antevs, who has been very active in study of glacial matters both in Europe and North America, has evaluated the period since the climax of the last glaciation. He used varves for part of the period and isostatic adjustments of the earth's crust to fill in periods lacking varve record.[1]

He assigns 27,500 years to Late-Glacial time, which ended about 9000 years ago. He divides Post-Glacial time into three parts; Early, in which temperatures were as today; Middle, in which temperatures were higher than today; and Late, in which temperatures were as today.

Scandinavian folk lore goes back to stories of a migration from the south, perhaps from the vicinity of the Black Sea. This migration could conceivably have been coincident with the start of desert conditions in Persia and Mesopotamia; perhaps coincident with Antevs' Middle Post-Glacial time.

Wilmot H. Bradley (U.S. Geological Survey, 1929 E) studied varves and climate of the Green River epoch of Eocene time. He found three rhythms of climatic variation. One had the frequency of sun spot numbers. A second had an unexplained frequency of about 50 years. A third had a frequency of about 21,000 years, or equal to the period of the cycle of procession of the equinoxes, diminished by an opposed shift in eccentricity of the earth's orbit. He quotes other authorities in explaining the effect of this cycle of celestial events as connected with climate. There is the suggestion that when ahelion occurs during the winter as it does now in the southern hemisphere, winters will be longer and cooler, summers shorter and hotter. When perihelion occurs in winter as it does now in the northern hemisphere, winters will be shorter and milder, summers longer and cooler. In any case, this condition will not affect mean annual temperature. Over at least 6 cycles of over 21,000 years each studied in Green River varves, there do not appear to be any variations in climate that are comparable with Pleistocene glaciation. It would seem probable that some change in basic conditions affecting solar radiation must have arisen at the start of Pleistocene time, and that those conditions are still effective.

Recent advances in the realm of nuclear physics suggest that solar radiation is at least partly an effect of nuclear fission.

Possibly our nuclear physicists should collaborate with our astronomers to watch for criteria from which solar radiation can be forecast. Changes of moderate total amount affect us materially. Without outside heat reaching the earth, the temperature might be expected to reach O deg. Rankine or -460 deg. F. Calgary mean of 38 deg. F. is 498 deg. R. A drop of 6 deg. to 32 deg. F. or 1.2 per cent would be sufficient to bring permanent frost to the ground, although some forage crops could be grown. A drop of 2 per cent would mean almost boreal conditions. A rise of 2 per cent would so increase evaporation as to make much of the Palliser triangle a desert. Mountain glaciers would recede to an extent that would cut down the dependable summer runoff of streams now used for irrigation.

We are not suggesting that this will take place. It could be only after a lapse of many years in any event, but the Eastern Rockies Forest Conservation programme, if made effective as a long-range project will be some assurance against the evil day of continued rise in temperature.

Floyd K. Beach, M.E.I.C.

The Petroleum and Natural Gas Conservation Board, Calgary, Alberta.

[1]Varves are annual accretions of sediment in lakes, characterized by recognizable variations in composition that mark each varve as an annual increment

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Excerpt from
"Science in a Tavern"
by Charles S. Slichter

One of the most serious afflictions of the human race is the inborn and violently hereditary deformity of right-handedness. I do not mean right-handedness in the trivial sense that a man reaches with his right arm for food and drink, but that monstrous form of right-handedness by which man reaches for conclusions with the right arm of prejudice. He has developed the long and over-muscled right arm of prejudice, apparently to become his main help in time of trouble, and has constantly exercised it to his undoing. He still possesses, after ages of experience, only a short and underdeveloped and underexercised left arm of reason, which nature intended to be the chief implement with which to reach for conclusions. Woe to all of us if we do not remember that it is written: "If thy right hand offend thee, cut it off!"

News of Other Societies

The Canadian Electrical Association (Room 704, Tramways Bldg., Montreal 1, Que.), announces that the annual winter conference, will be in Quebec City January 16 to 18, 1950.

The Institute of Power Engineers (496 Church Street, Toronto, Ont.), has arranged the Power Show to take place at the Royal York Hotel in Toronto, November 28 to December 1, 1949.

The 1949 annual meeting of the American Society of Mechanical Engineers, (29 West 39th St., New York 18, N.Y.) will take place November 27 to December 2, in New York City.

The American Society of Civil Engineers (33 West 39th Street, New York 18, N.Y.) has announced the programme of the fall meeting in Washington, D.C., November 2 to 4, 1949.

The annual meeting of the Society for Experimental Stress Analysis (P.O. Box 168, Cambridge 39, Mass.) will be held at the Hotel New Yorker, New York, on November 30 to December 2, 1949.

The fifth annual meeting of the National Conference on Industrial Hydraulics, at the Sheraton Hotel, Chicago, October 26 to 27, 1949, is sponsored by the Armour Research Foundation and the Graduate School of Illinois Institute of Technology.

Inquiries should be addressed to S. F. Musselman, Secretary of N.C.I.H., Technology Center, Chicago 16, Ill.

The annual meeting of the American Institute of Chemical Engineers for 1949 will be held at the William Penn Hotel, Pittsburgh, Pa., December 4 to 7, 1949.

The 57th annual meeting of the Society of Naval Architects and Marine Engineers (29 West 39th St., New York 18, N.Y.) is scheduled for November 9 to 12, 1949, at the Waldorf-Astoria Hotel in New York City.

Personals

Notes of the Personal Activities of Members of the Institute

Dr. J. A. Allan, M.E.I.C., retired at the end of August as professor of geology at the University of Alberta. He had been appointed to that post in 1912.

Professor Allan was born at Aubrey, Quebec, and received the degrees of B.A. and MSc. from McGill University. He went from there to a teaching fellowship at the Massachusetts Institute of Technology where he received the degree of Ph.D. in 1912. He has been for many years a Fellow of the Royal Society of Canada and was at one time chairman of the geology section of the Society.

One of Dr. Allan's greatest contributions to the University, apart from his teaching, was the building up of a large collection of minerals and fossils, making the geological museum at the University of Alberta the best in Western Canada.

Dr. Allan has long been a member of Canadian Institute of Mining and Metallurgy and is a past president of that organization. He is also a member of the Association of Professional Engineers of Alberta, of which he was president in 1930. Active in the Research Council of Alberta since its formation 1919, Dr. Allan was responsible for the establishment of the Alberta Geological Survey.

Dr. Allan's own special field of research has been the mapping of the coal fields of Alberta together with general studies in geology throughout the province and in the Rocky Mountains. He has contributed over 100 scientific papers to the literature on these subjects. In recognition of his long service and great contribution to the study of this field, the Geographic Boards of Canada and of Alberta last year gave Dr. Allan's name to a mountain in the Banff area.

John A. MacArthur, M.E.I.C., project engineer with Stadler, Hurter & Co., consulting engineers, Montreal, visited the Dominion of Pakistan on two occasions recently in connection with the prospective establishment of a pulp and paper mill in East Bengal north of Chittagong. Stadler, Hurter & Co. received a direct request from the Minister of Industry, Hon. Fazlur Rahman to prepare a report, which was completed in Montreal and submitted to him in August.

D. G. Geiger, M.E.I.C., councillor of the Toronto Branch of the Institute, spent the greater part of the past summer in Europe. He attended a meeting of the International Telecommunications Union, in Paris, representing the Canadian Telephone Association as consultant to the Canadian Government delegation. The International Telecommunications Union meets at regular intervals, to establish uniform practices for telecommunication. Practically every country provides representation.

On September 1, Mr. Geiger transferred from the position of transmission engineer, Western Area, of the Bell Telephone Company of Canada, to that of plant extensions engineer.

W. L. Saunders, M.E.I.C., division engineer of the Department of Highways of Ontario at Ottawa, Ont., has been transferred to Owen Sound, Ont., as division engineer.

Mr. Saunders who has been with the Department since 1922, is past vice-president of the Institute, and a past chairman of the Ottawa branch.

C. E. B. Conybeare, M.E.I.C., who for the past two years has been studying at the State College of Washington, has been appointed assistant professor in geology at the University of Manitoba. During the past two summers Mr. Conybeare has been employed by Eldorado Mining and Refining (1944), Ltd. and has investigated uranium deposits in gold fields area, Saskatchewan.

E. O. T. Piers, M.E.I.C., of Halifax, has been appointed honorary consul of Brazil for the City of Halifax.

Born at Wolfville, N.S., Mr. Piers was located in Brazil for 21 years, as dean of the Engineering School of MacKenzie College in Sao Paulo.

After receiving his bachelor of arts degree from Acadia University, he proceeded to McGill University, Montreal, where he graduated in civil engineering. Before going to MacKenzie College, Mr. Piers lectured for four years at McGill.

Mr. Piers returned to Nova Scotia in 1931 and since that time has been engaged in engineering work and lecturing in the province.

R. A. Yapp, M.E.I.C., sales manager of Bepco Canada Limited, Montreal, has been appointed to the board of directors of that firm. A graduate of the University of London, England, Mr. Yapp has been with the company for twenty-nine years.

R. E. Regan, M.E.I.C., of Bepco Canada Limited, has been appointed to the board of directors of the company. He has seen 25 years of service with Bepco and is Ontario district manager, residing in Toronto. He is a graduate in electrical engineering from the Royal Technical College.

C. I. Bacon, M.E.I.C., general manager of Cornwall Street Railway Light and Power Co. Ltd., has been appointed a director of the Company. He has been with the Cornwall concern since 1938, when he joined it as assistant general manager.

He is active in various technical organizations, including the Canadian Electrical Association, where he is chairman of the utilization and sales section and a member of the executive committee.

Ludger Gagnon, M.E.I.C., who was elected recently as chairman of the Quebec Branch of the Institute, is deputy city engineer of Quebec City.

Mr. Gagnon is from Laprairie, Que. He graduated from Ecole Polytechnique, Montreal, in 1927 and from Massachusetts Institute of Technology in 1928. He joined the staff of the City of Quebec that year as assistant city engineer.

A. G. Asplin, M.E.I.C.

A. G. Asplin, M.E.I.C., chairman of the Niagara Peninsula Branch of the Institute, is assistant chief draughtsman of Horton Steel Works Limited, Fort Erie, Ont.

Mr. Asplin is from Lethbridge, Alta., and studied at McGill University, Montreal, receiving the degree of bachelor of engineering in 1938. He joined Horton Steel Works that year and was with the Company until 1941. He went then to Dominion Bridge Company, Lachine, Que., working on design and estimation. He served from 1942 to 1945 in the R.C.A.F., after which he returned to Horton Steel Works Limited, and his present position.

E. L. Baillie, M.E.I.C., provisional chairman of the recently inaugurated Newfoundland branch, is division manager of Imperial Oil Limited, St. John's.

Born at Bridgeport, Conn., he studied at Nova Scotia Technical College, receiving the degree of B.Sc. in civil engineering in 1926. He was then professor of engineering at St. Francis Xavier University for two years, and in 1928 he received the degree of M.A. from that University.

He joined the Nova Scotia Highways Department, but went a few months later to the Nova Scotia Power Commission to work on the Mersey and Tusket river systems. He joined Imperial Oil Limited in 1930, at Halifax. He received his present appointment last year.

James F. McGuire, M.E.I.C., resigned in August as vice-president and sales manager of Alliance Electric Works Ltd., and president of Industrial Power Equipment Ltd., to join the board of directors of John G. Young Co. Ltd., Montreal. In his new position he will be in complete charge of sales and engineering for the company.

Mr. McGuire graduated from McGill University in 1934. He worked for eight years as sales and service engineer with the Lincoln Electric Company of Canada Ltd. During World War II he was loaned to the United Shipyards Ltd., to set up controls of arc welding operations in the construction of 10,000-ton cargo vessels.

R. J. Mattson, M.E.I.C., is engineer in charge of planning and design for the Damodar Valley Corporation, Bihar, India. He was previously located at Calcutta, with the same firm, which he joined some months ago.

He went to India in 1946 to be project officer for the Central Technical Power Board of the Department of Works, Mines and Power, of the Indian Government.

W. O. Maclaren, M.E.I.C., has established the firm, Maclaren, Vickery and Partners, industrial engineers, at Johannesburg, South Africa.

Mr. Maclaren was for 10 years associated with Brian Colquhoun and Partners, consulting engineers, London, England, for whom he went to Johannesburg a few years ago. He is the author of the "South African Letter" that has appeared in the Journal from time to time.

R. H. Stevenson, M.E.I.C., has been appointed to the position of branch manager of the Canadian Westinghouse Company's Moncton Office.

Mr. Stevenson, a native of Woodstock, N.B., attended the University of New Brunswick (electrical engineering '34) and entered the Westinghouse apprentice engineers course on graduation. He joined the Montreal Office, Apparatus Sales Division in 1941. Mr. Stevenson served with the Canadian Army from 1943 to 1946, retiring with the rank of lieutenant in the RCEME. Upon discharge he entered the Halifax Sales Office Apparatus Division and took charge of apparatus sales in Moncton when that office was opened in 1947.

E. L. Baillie, M.E.I.C.

James F. McGuire, M.E.I.C

E. T. Kirkpatrick, JR.E.I.C., is assistant to F. D. Bolton, of Vancouver, B.C., who was recently appointed sales representative in British Columbia for the Electric Machinery Mfg. Company, Minneapolis, Minn.

Mr. Kirkpatrick, a graduate of University of B.C., class of 1947, served with Canadian General Electric Company at Peterborough. He joined F. D. Bolton Ltd., electrical manufacturer's agent, in 1948.

James A. Brown, JR.E.I.C., joined the staff of Dominion Welding Engineering Company Limited in August last. He is Toronto manager for the Company. He was formerly with Spruce Falls Power & Paper Company Ltd., located in Toronto as special expediter.

Jack Haworth, JR.E.I.C., is on the staff of R. A. Rankin Co., Ltd., Montreal.

He graduated from Queen's University in 1947, with the degree of B.Sc. in mechanical engineering. He was with the Rankin Company in 1948, doing inspection and supervision of installation of equipment in a rayon plant at Cornwall, Ont. He was then with Stadler, Hurter & Co., Montreal for a time, rejoining R. A. Rankin recently.

Mortimer Hendler, S.E.I.C., is employed by the Department of Mines and Resources, on highway construction in the Yukon Territories. He graduated this year from McGill University in civil engineering.

John Hunter Wright, S.E.I.C., who obtained his bachelor of engineering degree with honours in mechanical engineering at McGill University last spring, has been awarded the David Bounerie Memorial Scholarship for post-graduate study at the University of California.

Visitors to Headquarters

John Freeman, M.P., Parliamentary Secretary for the Ministry of Supply, London, England, September 6.

Guy Savard, JR.E.I.C., Montreal, September 8.

Stephen L. Tyler, of the American Institute of Chemical Engineers, New York, N.Y.

S. D. Kirkpatrick, Short Hills, N.Y.

C. J. Mackenzie, Hon. M.E.I.C., Ottawa, Ont., September 15.

J. H. Morgan, M.E.I.C., Ramadi, Iraq.

A. H. Hull, M.E.I.C., Toronto, Ont.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Adam P. Linton, M.E.I.C., of Regina, Sask., died in hospital there on August 21, 1949, after a brief illness. Mr. Linton had retired in 1947 as chief bridge engineer of the Saskatchewan Department of Highways.

Mr. Linton was born at New Hamburg, Ont., in 1884. He studied at Galt Collegiate Institute and at University of Toronto, graduating from the latter in 1908 as a B.Sc. in mechanical engineering. After graduating he was employed by Dominion Bridge Company, Montreal, until 1911. He then worked for a year with the St. Lawrence Bridge Co., in Montreal, after which he went to Saskatchewan to be chief bridge engineer of the province.

During his service with the highways department, Mr. Linton was responsible for the designing and construction of hundreds of bridges throughout the province. Two of the last projects with which he was associated before his retirement were the overhead at the C.P.R. main line just west of Belle Plaine and the preliminary work on the Saskatchewan Landing bridge.

Mr. Linton had a distinguished service record in the First World War. He enlisted in the 68th Infantry Battalion in 1915, was commissioned and went overseas with the unit. Transferred to the Canadian Engineers in England, he served with the Canadian Railway Troops in France, subsequently reaching the rank of major.

Mr. Linton also served with the Royal Engineers in Palestine and Mesopotamia where he was actively engaged in bridge construction work. He also marched into Jerusalem with General Allenby. For his services in the Middle East, Mr. Linton was awarded the O.B.E. and was mentioned in dispatches by Gen. Allenby. After the war he was promoted to the rank of lieutenant-colonel.

Mr. Linton is a past president of the Association of Professional Engineers of Saskatchewan. He was a councillor of the Engineering Institute in 1939, and was chairman of the Saskatchewan Branch in 1935 and 1942. He joined the Institute as a Student in 1908, transferring to Associate Member in 1913, and to Member in 1935.

C. J. Desbaillets, M.E.I.C., chief engineer of the engineering division of the City of Montreal, died on August 25, 1949, at his residence. He had been in poor health for some time.

Mr. Desbaillets was born at Geneva, Switzerland, in 1884. He was educated in Switzerland and he graduated as an electrical engineer from the Technical Institute at Bienne, Switzerland, in 1903. He was employed on rural electrification in Switzerland for a time, before coming to Canada in 1904. Here, he was engaged by the Rolland Paper Company on installation of turbines. He was later employed for 4 years in the development of hydro-electric power and installation of transmission lines and sub-stations for Shawinigan Water and Power Co. He later became associated with Canada Paper Co. at Windsor Mills, Que. And he worked for five years as district engineer for Canadian Westinghouse Co. Ltd., for Quebec and the Maritime provinces. From 1917 to 1920 he served as chief engineer and manager of public services for the City of Sherbrooke.

In 1920 he joined Montreal's public works department as engineer attached to the waterworks commission, and a year later was named chief engineer of the Montreal Water Board. Under his jurisdiction a new waterworks system entirely electrically operated was built, including the pumping station, the filter beds, reservoirs, main conduits, dykes and bridges.

In 1941 he was appointed chief engineer of the engineering division of Montreal. Under his supervision the central police signal system was set up, also the teletype system, and he supervised the building of the fire alarm system. He also supervised modernization of the city's lighting system and numerous other important public works.

Mr. Desbaillets was a member of the Corporation of Professional Engineers of the Province of Quebec; a member and for some years, director of the Canadian Section of the American Water Works Association; and a member of the National Geographic Society. He was decorated with the Legion of Honour by the French Government. He was a past chairman of the Montreal Branch of the Engineering Institute. He had joined the Institute in 1917 as an Associate Member, transferring to Member in 1920.

Wm. Buick Scoular, M.E.I.C., of St. Catharines, Ont., who was killed in a plane crash of September 9, 1949, at Mount Tourmante, Que., was development engineer for the Ontario Paper Co. Ltd., Thorold.

Mr. Scoular was born in 1903 at Kilmarnock, Scotland, where he graduated from the University of Glasgow with a degree of B.Sc. in engineering in 1923. He was an apprentice with A. Barclay Sons & Company Limited, locomotive builders, Kilmarnock, from 1921 to 1926.

He was with Glenfield & Kennedy Limited, hydraulic engineers, until 1929, after which he came to this country and joined the staff of the Dominion Bridge Co. Ltd., as a designer, remaining until 1936. That year he became assistant engineer in the Laurentide Division of the Consolidated Paper Corporation Limited, at Grand'Mere, Que. He was later named division engineer of the Wayagamack Division of the Corporation. On leave of absence, in 1942 he became works manager of the Dominion Bridge Company's gun plant at Vancouver, B.C. He returned to Consolidated Paper, but in 1944 he joined the Powell River Co. Ltd., in Vancouver. In 1946 he accepted the position with the Ontario Paper Company, which he held at the time of his death.

Mr. Scoular became an Associate Member of the Institute in 1930, transferring to Member in 1940.

John Henry Maude, M.E.I.C., chief designer at Industrial Machinery Division, Dominion Engineering Co., Ltd., Montreal, died on July 17, 1949.

Mr. Maude was born in 1896 at Manchester, England. He studied at the College of Technology, Manchester, obtaining the degree of associate in 1921. He had served an engineering apprenticeship with Sir W. G. Armstrong Whitworth at Manchester. From 1917 to 1924 he was employed as a draughtsman and designer for the general engineering department of that Company. From 1924 to 1929 he was leading designer with Messrs. Vickers Armstrongs, Manchester.

Mr. Maude came to Canada in 1929 as a mechanical engineer, for Dominion Bridge Co. Ltd., at Lachine, Que. He transferred in 1934 to the Dominion Engineering Co. Ltd., Montreal where he was appointed chief designer of the Mining, Metals and Plastics Department. He was appointed in 1943 to the position he held at the time of his death. During the recent war he was particularly responsible for the design and development of modern hydraulic presses used in the manufacture of shell cases.

In 1942 he was awarded the Duggan Medal and Prize of the Engineering Institute, for a paper entitled "The New Oil-Hydraulic Press in Munitions Manufacture." He became a Member of the Institute in 1930, transferring to Member in 1940.

Adrien Miville Deschenes, M.E.I.C., of Riviere du Loup, Que., died in April 1949.

Mr. Deschenes was born in 1885, at St. Roch des Aulnaies. He studied at Ecole d'Arpentage, Quebec, and at Ecole Polytechnique, Montreal, graduating from the latter as civil engineer in 1912.

He was engaged in engineering work with Contractor's Limited, Montreal from 1912 to 1914, with Canadian Inspection & Testing, from 1914 to 1916, with Hildreth & Co., New York, from 1916 to 1919. He joined the staff of the provincial Department of Roads that year, as division engineer at Quebec City. He served in that capacity for many years.

Mr. Deschenes joined the Institute as Member in 1945.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

October 20th, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the November meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to cooperate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BURKE—WALTER ERNEST, of Montreal, Que. Born at Liverpool, Eng., June 24, 1916. Educ.: B.Sc., (Eng.), Univ. of London. 1938 (City & Guilds Engrg. College, London, 1935-38); 1936 and 1937 (summer work), fitter and machinist, Automotive Engineering Co., Twickenham; Metal Propellers Ltd., Croydon, Eng.; 1938-40, jr. brake engr., Westinghouse Brake & Signal Co., Ltd.; 1941-44, Officer I/C Railway Mobile Workshop, R.C.E.; 1944-46, Workshops Officer with Transportation Stores Unit in Italy, i/c workshops carrying out general repairs to misc. mechanical plant; 1946-49, Staff Officer with rank of Major, Railway HDQS, British Occupation Zone of Austria; at present, sales engr. Canadian Car and Foundry Co., Montreal, Que.

References: R. Lanctot, R. H. Mulock, L. S. Cossitt.

CURTIS—RALPH WILLIAM, of Winnipeg, Man. Born at Winnipeg, Man., Feb. 20, 1923. Educ.: B.Sc., (Elect.), Manitoba, 1945; 1942-43, (summers), elect. dftsman., Ford Motor Co. (Canada); 1945, (summer), stress analysis, jr. engr., Turbo Research Ltd.; with Univ. of Manitoba, as follows: 1945-47, demonstrator in continuous current, alternating current and radio laboratories, 1947-49, lecturer in continuous current machinery, assistant in radio lab., at present, lecturer in elect. engr.

References: E. P. Fetherstonhaugh, A. E. Macdonald, N. M. Hall, N. A. Williams, W. F. Riddell.

CUTT—JOHN CALVIN, of Sydney, N.S. Born at Goderich, Ont., Oct. 26, 1920. Educ.: B.A.Sc., (Metall. Engrg.), Toronto, 1948; 1948 to date, research metallurgist, Dominion Steel and Coal Corporation, Sydney, N.S.

References: N. A. Parlee, E. J. Prince, C. N. Murray, M. W. Booth, C. M. Anson, J. H. Fraser.

FERGUSON—DONALD YOUELL, of Toronto, Ont. Born at Toronto, Ont., Dec. 6, 1916. Educ.: B.A.Sc., (Chem.), Toronto, 1940; R.P.E., Ontario; with Canadian Industries Limited, as follows: 1940, sales and clerical, general chemical divn., 1940-44, chemist, lab. supervisor, prod. supervisor, guncotton plant, Nobel explosive works, 1944-46, trainee for technical sales, including period in develop't. lab., plant, office and field, fabrikoid divn., New Toronto, 1946 to date, sales representative, fabrikoid divn., Toronto, Ont.

References: L. L. Youell, C. K. McLeod. J. G. Hall, H. H. Angus.

HETRICK—ROBERT, of Hamilton, Ont. Born at Gourock, Scotland, March 24, 1918. Educ.: B. Eng., (Metall.), McGill, 1939; R.P.E., Ontario; 1936-37, (summers), International Nickel Co., smelter, Copper Cliff, Ont.; with Steel Co. of Canada, as follows: 1938, (summer), St. Henry Works, Montreal, 1939-41, graduate training course, Hamilton, 1941-42, plate inspector at newly constructed plate mill, 6 mos. in plate order dept.; 1942-46, R.C.E.M.E.; Steel Co. of Canada, 1946-47, sales dept., asst. to sales mgr., heavy plate divn., 1947, shift foreman, coke oven and biproduct divn.; 1947 to date, sales engr., Metals and Alloys Ltd., Leaside, Ont.

References: H. O. Peeling, E. T. W. Bailey, N. Metcalf, J. M. Elliott, A. E. Tuck.

JONES—HAROLD, of Niagara Falls, Ont. Born at Manchester, Eng., Jan. 29, 1909. Educ.: Manchester College of Technology, 1927-37; Higher National Certificate in Mech. Engrg.; A.M.I.M.E., London; with Metropolitan Vickers Electrical Co., Ltd., Trafford Park, Manchester, as follows: 1924-30, apprentice. 1930-32, special trainee, 1932-33, dftsman., 1933-40, develop't. engr., responsible for develop't. new turbines, inventing improved governor mechanisms, etc., 1940-41, develop't. engr., i/c group of dftsmen. for secret weapon develop't., 1941-43, test engr. for jet propulsion engines, 1944-45, liaison engr., 1945-47, engr. i/c certain sections of jet engine design; 1947-48, turbine sales engr., Australian General Electric Ltd., Sydney; at present, a steam turbine engr., H. G. Acres & Co., Niagara Falls, Ont.

References: S. W. Andrews, A. W. F. McQueen, R. A. H. Hayes, L. A. Petrie, W. P. London.

McLELLAN—JOHN WILLIAM, of Shawinigan Falls, Que. Born at Regina, Sask., June 21, 1925. Educ.: B.A.Sc., (Chem. Engrg.), British Columbia, 1948; 1948 to date, tech. asst. in chemical develop't. dept., investigation of plant process, operations in view of difficulties encountered, and improvements desired, Canadian Industries Limited, Shawinigan Falls, Que.

References: J., R. Eastwood, F. W. Hubberd, J. N. Finlayson, A. Peebles, S. H. deJong.

MOON—ALLAN RAMSAY, of Toronto, Ont. Born at Melbourne, Australia, Sept. 28, 1893. Educ.: B. Eng., (Civil), Melbourne Univ., 1923; M., I Structural Engrs., London; R.P.E., Ontario; 1915-17, Jr., City Engineer's Office, Victoria; 1923-24, design checker, Bldg. Surveyor's office, Melbourne; 1924-25, chief steelwork designer, Johns & Waygood, Ltd.; 1926-28, mgr., engrg. dept., Robert Bryce & Co.; 1928-31, tech. director, E.M.F. Electric Co. Ltd., Australia, develop't. use of welding in structl. and general engrg., drafted first standard specification for use of welding in bldg. constrn. for Australian Standards Assn.; 1931-35, constrn. engr., develop't. use of welding in structl. and genl. engrg., Murex Welding Processes Ltd., England; 1935-38, sec., Institute of Welding; 1938-44, sec., Institute of Welding and dir. of research for Welding Research Council; 1939-44, dir. Advisory Service on Welding, Ministry of Supply, suggested and organized section under Dir.-Gen. or Research and Develop't., to insure effective use of welding in prod. of munitions; 1944-45, Dir. of Research, Welding Research Council; 1945-47, Dir. of Research, British Welding Research Assn.; at present, consultg. civil engr., specializing in welding, Toronto, Ont.

References: E. R. Graydon, C. D. Carruthers, G. Cape, E. A. Cross, B. R. Perry.

MORRIS—JACK, of Cornwall, Ont. Born at March, Cambs., Eng., April 1, 1904. Educ.: Lincoln Tech. College, 1926-29: 5 yrs. Naval Engrg. and Ordnance—apprent. H.M.S. "Fisgard", Portsmouth, 6 mos., Woolwich Arsenal—Final Naval Exam. passed; with Ruston & Hornsby Ltd., Lincoln. Eng., diesel engines, centrifugal pumps, etc., as follows: sales engr., Glasgow, 1932-34, tech. rep. in Canada and N'fld., 1934-39, tech. representative, Maritime Provinces; 1941-45, Staff Officer, Lt. Col. N.D.H.Q., Ottawa, Asst. to Dir. of Chemical Warfare & Smoke Flame Warfare Develop't. & Research; 1945 to date, mgr., engrg. division, admin. and supvrn. all engrg. aspects of viscose rayon mfg.—overall supvrn. of constrn. of large addition to plant, genl. engrg. planning for future expansions, Courtaulds (Canada) Limited, Cornwall, Ont.

References: J. B. Stirling, E. G. M. Cape, D. Giles, H. Schmelzer, W. D. Kirk, D. Ross-Ross.

SALOMON—CARLOS SAMUEL MARCOS, of Montreal, Que. Born at Sicuani, Peru, June 13, 1916. Educ.: B. Eng., (Mech.), McGill, 1945; mech. dftsman., Electric Tamper & Equipment Co., Montreal; 1945-47, steam generating equipt. designer, Dominion Bridge Co., Limited, Montreal; 1947-49, planner and supervisor of constrn., soap factory, Zoila S. deZugbi, Sicuani, Peru.

References: A. S. Wall, G. N. Martin, F. Block, C. D. Bailey, G. J. Dodd.

THROSSELL—LAURANCE GEORGE, of Vancouver, B.C. Born at West Australia, June 23, 1922. Educ.: B. Eng., Univ. of West Australia, 1945; A.M., Inst. Engineers of Australia; 1943-45, asst. mtce. engr., shift engr. i/c production, Small Arms Amm. factory; 1945-46, returned to Univ. of West Australia to graduate from B.Sc., (Eng.) to B. Eng. (Hons.); 1946-47, lecturer in electrical and mech. engrg. at Technical College of Education Dept. of West Australia; 1947-48, elect. and mech. engr. i/c of processing plant, Midland Mining Co., Ltd., Perth, W.A.; 1948-49, elect. engr. grade I, Dept. of Works & Housing, Perth, W.A. (recently arrived in Canada).

References: O. F. Blakey, J. W. Hayman, J. Hondras, W. J. Norgard, W. M. Telford (all corporate members of Institution of Engineers, Australia).

FOR TRANSFER FROM THE CLASS OF JUNIOR

CANTWELL—EDWARD MARC, of Longueuil, Que. Born at Espanola, Ont., on July 31, 1919. Educ.: B. Eng. (Mining) McGill, 1942; R.P.E., Que.; 1942-45, surveyor, Consolidated Mining & Smelting; 1945-46, dftsman., Stadler Hurter & Co.; 1946-49, salesman, Darling Bros. Ltd. (St. 1939. Jr. 1946)

References: A. B. Darling, J. D. Alder, A. T. Hurter, K. R. Mever, W. G. Hole, J. Missler.

CHILMAN—WILLIAM RICHARD, of Hamilton, Ont. Born at Hamilton on Oct. 27, 1917. Educ.: B.Sc. (Civil), Queen's, 1942; R.P.E., Ont.; since 1944 returned from overseas as 1st Lieut., in 13 Fd. Coy. R.C.E., has been in the general contracting business, The Tope Construction Co., Hamilton, as general superintendent; employer, J. D. Chilman (father) owner of business; work consists of pricing, estimates, layout supervision on site costs on various projects in Hamilton. (St. 1941. Jr. 1946)

References: N. Wagner, A. Love, W. S. Macnamara, E. H. Darling, A. R. Hannaford, W. L. McFaul.

CLARK—EVERETT F. J., of Calgary, Alta. Born at Hamilton on Oct. 18, 1918. Educ.: B.A.Sc. (Civil), Toronto, 1947; R.P.E., Ont.; summers, 1936, laborer, road construction; 1938 and 39, foreman on road constrn.; 1940, (summer) instrument man, Dept. of Hwys., Ottawa; 1940-45, Officer, RCAF; 1946 (summer) resident engr., Proctor, Redfern & Laughlin; 1947 to date, engineer, Dept. of Sales, Canada Cement Co. (Jr. 1948)

References: J. M. Breen, D. O. Robinson, R. A. Crysler, R. M. Hardy, L. A. Thorssen, C. F. Morrison.

DANSEREAU—JOSEPH H. RENE, of St. Eustache, Que. Born at Three Rivers on Nov. 14, 1917. Educ.: B.A.Sc. (C.E.), Ecole Poly., 1942; R.P.E., Que., 1942, structural designer, Dominion Bridge Co.; 1942-45, R.C.A.F. Navigation Instructor; with Dominion Bridge Co. as follows: 1945-46, str'l. designer; 1946-47, boiler designer; 1947 to date, sales engr., Montreal. (St. 1940. Jr. 1944)

References: R. S. Eadie, D. B. Armstrong, H. M. Watson, G. H. Midgley, G N. Martin, H. J. Leitch, J. P. Borbey, J. A. Lalonde.

DEMBICKI—STEVE, of Waterloo, Ont. Born at Calgary on Oct. 9, 1916. Educ.: B.Sc. (Mining), 1940, M. Eng. 1941, McGill Univ.; 1935-40, summers, C. M. & S. Co. Smelter, Trail, B.C.; 1941-45, engr. metal laboratory, product control and methods depts. Defence Industries Ltd.; 1945 to date, with Dominion Electrohome Industries, Kitchener, as supervisor of AMPD methods dept.; at present, sales engr. contract sales dept. (Jr. 1941)

References: S. Shupe, E R. Hammond, M. A. Montgomery, W. J. Farago.

FAST—MORRIS, of Longueuil, Que. Born at Blaine Lake, Sask., on May 8, 1917. Educ.: B.Sc. (Mech.), Univ. of Sask., 1942; R.P.E., Que.; summers, 1937, 38, 39, Northern Electric Co. Ltd., Mtl. contract inspection dept.; Sept. 1939-Aug. 1940, head of material and production control dept., Ottawa Car & Aircraft Co. Ltd.; with Aluminum Co. of Canada Ltd.; Nov. 1940-Sept. 1941, inspection and production control, Kingston Works; 1942-43, mtce. engr., Shawinigan Falls Works; 1944-48, development engr., sales dept., Mtl.; 1948 to date, president, Locweld & Forge Products Ltd., Mtl. (St. 1937. Jr. 1943)

References: J. L. deStein, J. B. Block, J. McD. Scott, M. N. Hay, N. B. Hutcheon, I. M. Fraser, W. L. Pugh.

GARTON—JOHN McCONNELL, of Sarnia, Ont. Born at London, England, on Jan. 26, 1919. Educ.: B. Eng. (Chem.), Univ. of Sask., 1942; with Imperial Oil Ltd. as follows: 1942-43, Lube Oil Research, technical and research dept.; 1943-44, control lab., Polymer Corp.; 1944-49, field testing of petroleum products, Lube Oil Research, Cracking Coil Pilot Plant Work, Sarnia. (St. 1942. Jr. 1945)

References: D. L. McGillivray, F. F. Dyer, F. F. Walsh, C. P. Warkentin, C. P. Sturdee, D. S. Simmons, A. L. Helliwell, G. R. Henderson.

HARAKAS—PETER ARISTIDES, of Quebec City. Born at Brantford, Ont., on Nov. 25, 1912. Educ.: B.A.Sc. (Civil), Toronto, 1942; R.P.E., Que.; with H.E.P.C. of Ontario as follows: 1941 summer, instrument man; 1942-43, jr. engr. and senior instru'man; 1943-44, estimator, Dominion Constrn. Corp., Toronto; with Anglo Canadian Pulp & Paper Mills Ltd. as follows: 1944-46, resident engr.; 1946-49, general engineering, Limoilou, Que. (Jr. 1944)

References: W. Jackson, O. Holden, O. Johnston, C. R. Young, R. F. Legget, J. O'Halloran, R. H. Farnsworth.

FOR ADMISSION

HERRING—DENNIS P. HERRING, of Sarnia, Ont. Born at Biggar, Sask., on April 16, 1915. Educ.: B.Sc. (Mech.), Sask., 1942; R.P.E., Ont.; summers, 1936, 38, 39, Hudson Bay Mining & Smelting; 1940 and 41, machine shop mechanic on various types of work; 1942-43, mech. engr., on piping, heating, ventilation, concrete, steel and tender design, H.B.M. & S. Flin Flon; 1943-44 (5 mos.) mech. engr. J. T. Hepburn, Toronto; 1944-47, plant engr. mtce. power house, equipt. design, constrn., Dominion Rubber Merchants Factory, Kitchener, Ont.; 1947 to date, one year as field engr. on mtce. constrn.; 1½ years special projects engr. Polymer Corp., Sarnia. (St. 1942. Jr. 1946)

References: G. R. Henderon, F. Walsh, I. M. Fraser, J. W. Graeb, N. B. Hutcheon.

LATREILLE—ANDRE, of Montreal, Que. Born at Montreal on Nov. 6, 1917. Educ.: B.A.Sc. (Civil). Ecole Poly. 1942; R.P.E., Que.; 1942-48, Atlas Construction Co. Ltd.; 1948-49, general manager, Labrador Construction Co. Ltd., Mtl. (St. 1939. Jr. 1945)

References: I. Brouillet, E. G. Carmel, H. R. Montgomery, H. J. Gordon, A. Lalonde.

LEFEBVRE—JOSEPH JEAN, of Longueuil, Que. Born at Montreal on Oct. 7, 1916. Educ.: B.A.Sc. (C.E.), Ecole Poly. 1942; R.P.E., Que.; summers, 1939, Federal Public Work Dept.; 1940, Provincial Road Dept.; 1941, Collet Freres Ltd., Engineers and Contractors; 1942, designer, Dominion Bridge Co. Ltd.; 1942-44, production engr. and supt., Dominion Rubber Co. Ltd.; 1944 to date, co-proprietor and co-director, Dufresne McLagan & Associates Regd., Industrial Consultants, Mtl. (St. 1940. Jr. 1946)

References: I. Brouillet, H. Gaudefroy, L. Cartier, A. Duperron, J. A. Lalonde, J. A. Beauchemin, J. N. Langelier.

LEWIS—B. R., of Erindale, Ont. Born at Birch Hills, Sask. on Jan. 1, 1925. Educ.: B.Sc. (Eng. Phys.), Sask., 1947; R.P.E., Ont.; 1947 (7 mos.) outside plant engrg. dept. Bell Telephone Co., Mtl.; 1947 to date, development engr. testing, design and application aspect of engrg., Alliance Tool and Motor Co. (St. 1947. Jr. 1949)

References: I. M. Fraser, N. B. Hutcheon, R. A. Spencer, E. A. Hardy.

MacDONALD—IAN M., of Hamilton. Born at Saltspring, N.S., on March 9, 1919. Educ.: B. Eng. (Mech.), Nova Scotia Tech., 1942; R.P.E., Ont.; 1941, comb. eng. dept., Steel Co. of Canada; 1941-42, i/c of instruments, testing, mech. dept., Nova Scotia Tech.; 1942-44, Westinghouse Apprenticeship course; special studies comptrollers dept. Cdn. Westinghouse; (2 years) partner, Wentworth Sheet Metal Engrg., design, fabrication of sheet metal and structural products; at present Can. Westinghouse Co. Ltd., Hamilton. (St. 1941. Jr. 1944)

References: J. N. Finlayson, J. A. Vance, N. Metcalf, L. C. Sentance, M. L. Baker.

McDOUGALL—GEORGE EDWARD, of Greenville. South Carolina. Born at Moose Jaw, Sask., on April 7, 1913. Educ.: B.Sc. (Civil), Alberta, 1942; R.P.E., Alta.; 1942-45, design, detailing, bridges, Alaska Highway; also resident engr. Public Roads Administration; 1945-46, Northwest Service Command, Alaska Highway Maintenance; 1946-47, bridge engr., Dept. National Defense Army, Northwest Highway System, Whitehorse, Y.T.; 1947 to date. supervising engr., i/c projects consisting of schools, hospitals, textile bldgs., etc., Danial Construction Co. (St. 1942. Jr. 1944)

References: R. M. Hardy, I. F. Morrison, R. Archibald (A.S. C.E.), C. L. Cheves (A.S.C.E.), C. E. Daniel (A.I.E.E.)

MITCHELL—JOHN HUGH, of Hamilton, Ont. Born at Regina, Sask., on Feb. 5, 1917. Educ.: B.Sc. (Mech.), Univ. of Sask., 1941; R.P.E., Ont.; summers, 1940, instru'man. Dept. of Transport Airport Survey; with Canadian Westinghouse Co. as follows: 1941-43, engrg. apprentice; 1943-45, engr. in mech. engrg. div., working on substitute materials, process specfn.; 1945-49, refrigeration engr. in Appl. Div., responsible for design, material process, test specf. of domestic and commercial refrigeration units, C. W. Co., Hamilton. (St. 1940. Jr. 1945)

References: G. L. T. Vollmer, L. C. Sentance, H. O. Peeling, A. A. Moline, E. H. Toves, J. M. Elliot.

PHILLIPS—RONALD EDWARD, of Edmonton, Alta. Born at Banff, Alta., on Feb. 18, 1920. Educ.: B.Sc. (Elect.), Univ. of Alta., 1942; R.P.E., Alta.; summer, 1941 and 1942 (3 mos.) instructor, RCAF Radio School; 1942 (6 mos.) Cdn. General Electric Test Course; 1943, (6 mos.) instructor, E. E. Dept., Univ. of Alta.; 1943-45, active service, Lieut. (E) RCNVR; 1945-49, lecturer, E. E. Dept., Univ. of Alta.; 1946 (5 mos.) lighting service, Dept. C.G.E., Toronto; 1948 (5 mos.) Canadian Utilities Ltd., Vermilion Construction, 10,000 H.P. steam plant; at present, Asst. Prof. Elect. Dept., Univ. of Alberta. (St. 1942. Jr. 1944)

References: J. A. Harle, J. W. Porteous, R. M. Hardy, E. B. Cranswick, J. G. MacGregor.

REID—ROBERT ARTHUR, of Montreal. Born at Montreal on Feb. 3, 1920. Educ.: B. Eng. (Mech.), McGill, 1942; R.P.E., Que.; summer, 1939, apprentice, J. & R. Weir Ltd.; summers 1940 and 41, dftsman., Dom. Bridge Co. Ltd.; 1942, production eng., Dom. Engrg. Works Ltd.; with Dom. Bridge Co. Ltd.; 1942-43, elect. dftsman. and design; 1943, production engr. i/c forgings; 1943-45, RCEME; with Dominion Bridge Co. Ltd. as follows: 1945-47, dftg. design, testing work; 1947-48, special asst. to production mgr. i/c of shop scheduling; 1948 to date. cost accountant, Mtl. (St. 1942. Jr. 1946)

References: R. S. Eadie, R. M. Robertson, G. H. Midgley, P. Millar, L. A. Traver.

SLOAN—JOHN LUXTON, of Calgary, Alta. Born at Liverpool, England, on May 26, 1917. Educ.: (Assoc. R.Ae. Soc.); 1935-37, (summers) British Enka Silk Works; 1938-40, Bristol Aeroplane Co. aircraft inspector; 1940, R.A.F. passed exam on entering tech. branch; (six years) Engr. Officer, workshops O.C. of Lancaster Repair Squadron, England; 1946 with RAF, British Air Commission, Washington, D.C., as chief of engine branch, duties, mainly tech. liaison with U.S.A. manufacturer's of aircraft and engines; upon discharge from RAF as Squadron Leader joined

Cdn. Army RCEME as Captain (Engr. Officer); 1946-47, 12 month course Barryfield, on army mech. and elect. equipt.; returned to RCEME workshop, O/I of production, Calgary, Alta.: at present, Officer Commanding, Base Workshop, Calgary. (Jr. 1946)

References: C. R. Boehm. S. Stucken, E. W. Bowness, B. W. Snyder.

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References: C. W. Deans, C. Bentall, R. A. McLachlan, R. C. Pybus, H. W. Tye.

FOR TRANSFER FROM THE CLASS OF STUDENT

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References: C. A. Robb, P. Kellogg, J. Lefort, L. A. Wright, W. D. Laird.

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References: D. S. Ellis, L. F. Grant, D. M. Jemmett, A. Jackson, T. A. McGinnis, D. M. Jemmett, A. Jackson.

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References: W. C. Lorimer, C. S. Boyd, G. R. Lord, R. C. Wiren, W. J. T. Wright, T. R. Loudon, C. F. Morrison, M. W. Huggins.

YORK—THEODORE C., of Vancouver, B.C. Born at Vienna, Austria, Oct. 17, 1920. Educ.: Real Gymnasium, Vienna, 1934-38; Engineer-in-Training, B.C.; 1940-41, dftsman., i/c bill of mat. and tool design dftsman.; 1941-42, tool designing dftsman., Canadian Vickers Ltd., Montreal; 1942-43, dftsman., Murray, Jones & Co., Toronto; 1943-44, mech. designer, also worked on optical computations, Research Enterprises Ltd., Leaside, Ont.; 1944-45, one term at Univ. of B.C.; 1945-46, worked as jr. dftsman. on structl. work, Arthur Pearson, M.E.I.C.; M., I.C.E., Vancouver; 1946-47, mech. and structl. design dftsman., Powell River Co., Ltd., Powell River, B.C.; 1948-49, design engr., Great Lakes Paper Co., Ltd., Fort William, Ont.; 1949, (6 mos.), structl. design engr., H. A. Simons. Vancouver, B.C.; at present studying in England. (St. 1941)

References: T. D. Munro, N. Beaton, G. H. Bancroft, S. T. McCavour, P. R. Sandwell.

NEWS of the BRANCHES

Activities of the Thirty-one Branches of the Institute and abstracts of papers presented at their meetings

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The activities of 1949-50 were resumed with a very successful dinner meeting at the Cascade Inn, Shawinigan Falls, on September the 8th, held jointly with the local sections of the A.I.E.E. and C.I.C. An audience of 90 members and guests heard Dr. J. T. Rettaliata, dean of engineering at the Illinois Institute of Technology deliver a very witty and profusely documented talk on practical aspects of developments of gas turbines and jet propulsion motors.

In a former talk in April 1948 Dr. Rettaliata had covered the basic theory of the gas turbine. The basic thermodynamic cycle was reviewed, and the possible refinements described as recently applied to new installations, specially turbines for the Houdry catalytic oil crackers and a new coal burning gas turbine locomotive, recently put on trial run on the lines of the Union Pacific Railroad, in the United States. Considering lower price and greater availability of coal than oil, the railroads have great interest in developing a successful coal burning locomotive which would offer the advantage of continuous service, low maintenance, high starting and accelerating torque, low fuel cost and high thermal efficiency. The prototype now in circulation has shown definite promises, despite limitations in size of components, and a slightly lower thermal efficiency than diesels. Power transmission to the driving wheels is electrical, although torque converters are being studied. The coal burning turbines have offered problems of relatively long burning time of pulverized solid in comparison with machines using liquid or gaseous fuel, of satisfactory methods of pulverization, and of prevention of erosion of turbine blades, and in some cases of fouling of turbines with dust. These two last tendencies oppose one another, and satisfactory compromises are attainable.

Early European achievements were also described, especially by Brown-Boveri in Switzerland, and others. Turning to applications for propulsion of missiles and planes, Dr. Rettaliata made a brief recapitulation of velocities attained from origin to date, and pointed out the fundamental differences between propeller and jet propulsion. He indicated that Russian and especially British achievements in the field of jet propulsion are watched with the keenest interest from this continent. Indeed England is ahead of the United States and others, and may secure commercial advantages within two years as a direct result of its achievements. Dr. Rettaliata indicated that materials of construction presently in use, and developed mostly by Timken and Allegheny-Ludlum on this continent, allow sustained turbine inlet temperatures of 1500 deg. F. maximum. As the metallurgical possibilities improve, higher thermal efficiencies, now of the order of 30 per cent, in some cases, will immediately result from higher operating temperatures.

A brief outline of the possibilities of gas turbines in connection with atomic energy was disclosed, indicating possibilities of immediate applications.

The meeting was presided over by R. Kirkpatrick, vice-chairman of the Branch. E. T. Buchanan introduced the speaker, and J. S. Whyte found the appropriate words to thank him for a most interesting account of the field in which Dr. Rettaliata is now actively engaged, and has already contributed so much.

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Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, recent Ph.D. or equivalent with good background in organic chemistry preferably along the lines of wood and cellulose chemistry and fuels technology. Applicant needs capacity for contacting plant personnel and appreciation of engineering phases of problems. Position in British Columbia. Salary open. Apply to File No. 1118-V.

CHEMICAL ENGINEER OR HONORS CHEMISTRY, recent graduate (1943-1949) required by a metallurgical and chemical company in Western Canada. Salary open. Apply to File No. 1271-V.

CHEMIST required for processed food plant in Montreal. Must be responsible for control of quality and developing process for solving formula problems due to variations in raw materials and methods of manufacture. Ability to write clear concise reports is essential. Salary open. Apply to File No. 1275-V.

ELECTRICAL

SENIOR ELECTRICAL ENGINEER, required with 5-10 years experience for a large mining company in Quebec. Must be able to do layout and estimating for distribution and installation of electrical equipment on a large scale, previous experience in underground and open pit mines mill and factory. House available for a married man. Salary open. Apply to File No. 1266-V.

ELECTRICAL ENGINEER, bilingual, required by a large firm in Montreal, for supervision of electric meter repair and testing, also testing of electrical equipment (transformers, switches, etc.) Age 23 to 35 years. Must have completed test course with either General Electric or Westinghouse Company and have five years previous experience in supervision. Salary open. Apply to File No. 1270-V.

ELECTRICAL ENGINEER recent graduate, preferably with some experience in electronics required to work on electrical maintenance of a large printing plant in Montreal. The work will include electrical layout, organization of maintenance of electrical and electronic controls on large printing presses and the installation of new equipment. Salary open. Apply to File No. 1277-V.

ELECTRICAL ENGINEER recent graduate, required in Montreal for general duties. Salary open. Apply to File No. 1280-V.

ELECTRICAL ENGINEER recent graduate, required by an electrical firm in Montreal. Salary open. Apply to File No. 1281-V.

MECHANICAL

MECHANICAL ENGINEERS required in Ontario. The qualifications for the more senior of these positions are those of a person of considerable experience on machines as found in the Tool Engineering Department of the Automotive Industry. The other position requires the qualifications of a body layout engineer. Experience preferably obtained with the Automotive Industry. Salaries open. Apply to File No. 1268-V.

MECHANICAL ENGINEER, recent graduate required for sales engineering. Location Montreal. Salary open. Apply to File No. 1274-V.

MECHANICAL ENGINEER required for position of superintendent by a manufacturer of hospital equipment in Ontario. Applicant should have a good practical knowledge of operation of sheet metal finishing, painting, etc. Salary open. Apply to File No. 1282-V.

METALLURGICAL

PHYSICAL METALLURGIST AND FOUNDRY METALLURGIST required in British Columbia. Applicant for former position must have broad background in physical metallurgy, including heat treating problems, corrosion problems, studies of failures in metals, etc. Salaries open. Apply to File No. 1118-V.

MINING

MINING ENGINEERS required by a large company in the Province of Quebec. Two men with 2-5 years experience, must be able to do layouts. One with ten years experience in both underground and open pit mine operations. One with experience as mine safety director with two assistants. Houses available for married men. Salaries open. Apply to File No. 1266-V.

MISCELLANEOUS

GRADUATE ENGINEER with specialized training in trolley coach maintenance required by an Eastern Canadian public utility. State age experience and qualifications in first letter. Salary open. Apply to File No. 1263-V.

STRESS ANALYSISTS required by research and development engineers in England. Vacancies for both senior and junior man. Should have experience of stress analysis and allied problems for aircraft structures. Senior man's duties would be partly research. Apply to File No. 1264-V.

BUILDING INSPECTOR required by city in Western Canada. Duties would involve the operation of a department caring for the approval of designs, plans, proposed construction, the carrying out of certain design work also the operation of the department covering maintenance of the city buildings. Applicant must have ability to deal with public. Salary open. Apply to File No. 1265-V.

RECENT GRADUATE wanted immediately for time study work with a large mining company in Quebec. Preference given to bilingual persons with experience in this type of work. Salary open. Apply to File No. 1266-V.

MECHANICAL OR MINING ENGINEERS required by a large mining company in Quebec. One senior industrial engineer with experience in incentive wage negotiations, methods study, etc. Vacancies for general mill foreman with previous experience in ore-crushing, screening and mill production. Salary open. Apply to File No. 1266-V.

SALES ENGINEER required in Montreal with mechanical engineering training. Preferably applicant with some selling experience. The lines which he would have to handle would be contractors, road-building and industrial equipment as well as pumps of various types. Age 30-35 years with working knowledge of French. Salary open. Apply to File No. 1267-V.

GRADUATE ENGINEER for estimating required by well established steel fabrication company in Manitoba. Preference will be given to anyone having experience in estimating structural and plate fabrication - miscellaneous, ironwork and general machinery items. Applicants should state age, experience and salary expected. Apply to File No. 1272-V.

SENIOR INDUSTRIAL ENGINEERS required in Montreal. Applicants must be thoroughly experienced in production control, wage incentives and cost control and must be bilingual. Salary open. Apply to File No. 1276-V.

SENIOR ENGINEER required in Talara, Peru. Must be civil or mechanical graduate, 30 to 35 years of age with 5-10 years experience in general engineering preferably in connection with oil industry. Duties include technical assistance, all engineering problems. General and technical supervision of subordinates in office and field. Salary open. Apply to File No. 1278-V.

GRADUATE ENGINEER required for refinery maintenance in Talara, Peru, S.A. Preferably applicant 30-40 years of age with 5-10 years of oil refinery experience. Duties include refinery construction, technical advise to shop foreman, supervision of mechanical and construction work in refinery, ordering special equipment, etc. Salary \$525.00 U.S. Apply to File No. 1278-V.

SALES ENGINEER with experience in sheet metal work, especially as applied to food service equipment for hospitals, hotels, etc., to design layouts and do contact work for firm already well established in this line. Salary and bonus system to competent man will ensure excellent income. Apply to File No. 1279-V.

SALES ENGINEERS, graduates in mechanical engineering. Experience in refrigeration desirable. To act as company representative on territories, contacting dealers and assisting them in sales and service, by manufacturer of refrigerated equipment. Starting salary \$3,000.00 to \$3,600.00 per year plus expenses. Men required for Hamilton, Winnipeg, Edmonton and Vancouver. Apply to File No. 1279-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER, age 30 years, required by a pulp and paper company in the St. Maurice Valley. Preferably with some experience in a process industry with preference for Kraft pulp manufacturing. Excellent opportunity. Salary open. Apply to File No. 1222-V.

CHEMICAL ENGINEER required as sales engineer by large diversified chemical company in Montreal. Applicants should have sales experience and ability to sell to senior executives. Knowledge of paint industry helpful. Age 30 to 40 years, preferably bilingual. Location Montreal. Salary commensurate with qualifications. Apply to File No. 1239-V.

ELECTRICAL

ELECTRICAL ENGINEER required with about eight years experience in charge of electrical maintenance and construction crews. This position is an opportunity for advancement. Location Ontario. Salary depends on experience. Apply to File No. 1221-V.

PHYSICIST OR ELECTRICAL ENGINEER with first class honours degree from a recognized university to assist in patent work, good knowledge of electronics required. Age under 30. Initial salary up to $4,000.00 depending on qualifications. Apply to File No. 1225-V.

ELECTRICAL ENGINEERS required for the frequency conversion of a public utility in Ontario. Salary open. Apply to File No. 1235-V.

ELECTRICAL ENGINEER with three to five years experience required by a steel company in Montreal for design and layout of industrial installation and maintenance. Salary open. Apply to File No. 1236-V.

ELECTRONIC ENGINEER, fully qualified. At least five years laboratory experience in circuit design and radio physics. Salary open. Apply to File No. 1243-V.

ELECTRICAL ENGINEER 35 to 40 years of age required in Toronto as sales engineer. Must be thoroughly experienced in the utility field. Salary open. Apply to File No. 1245-V.

ELECTRICAL ENGINEER, age 25 to 35 years required in Toronto as Sales Engineer. Applicant will be required to cover industrial and jobing trade in Ontario (except Ottawa) and must be thoroughly experienced in this field. Salary open. Apply to File No. 1245-V.

GRADUATE ELECTRICAL ENGINEER, age 25 to 35 years required as field representative for Ontario firm. Applicant will be required to travel half of time covering all of Canada. Will not be responsible for direct sales but will be calling on representatives and distributors, etc. Salary open. Apply to File No. 1245-V.

SUPERINTENDENT for electronics laboratory required by Defence Research Board. Applicant should have post graduate training to Ph.D. level or equivalent also considerable experience in directing research groups in communications, radar, radio and serro-mechanisms. Apply to File No. 1249-V.

RECENT GRADUATE in electrical engineering required as assistant supervisor of distribution. Duties would be under supervision. Location Ontario. Salary open. Apply to File No. 1253-V.

GRADUATES IN ELECTRICAL ENGINEERING OR PHYSICS required in an expanding research and development laboratory in Montreal. Applicant must have at least 3 years design and manufacturing experience on radio transmitters or radar equipment. Salary open. Apply to File No. 1262-V.

ENGINEER OR PHYSICIST required by Canada's leading manufacturer of radio and electronic equipment. Preferably applicant with post-graduate degree, at least five years experience advanced development or research on electrical circuits. Pluse experience preferred. Able to plan and direct an engineering group. Location Montreal. Salary open. Apply to File No. 1262-V.

MECHANICAL

MECHANICAL ENGINEER with ten to fifteen years experience required in Montreal. Applicant would be responsible for engineering problems throughout firms, Canadian division, Halifax to the west coast. Directly supervise maintenance crew in major production plant. Location Montreal. Salary open. Apply to File No. 1241-V.

MECHANICAL ENGINEERS AND DESIGNERS. Fully qualified. Accustomed to working with small electromechanical device. Location Ontario. Salary open. Apply to File No. 1243-V.

MECHANICAL ENGINEER, 35 to 45 years of age with knowledge of plumbing, heating and air-conditioning required in Ontario. Duties would be estimating, layout and design with some supervisory and management duties. Salary from $200 to $350 to start. Apply to File No. 1247-V.

MECHANICAL ENGINEER required for layout and design of plumbing and heating equipment. Location Montreal. Salary open. Apply to File No. 1252-V.

MECHANICAL ENGINEER required for Toronto office of a firm of power house and dust collection specialities. Applicant should have experience in supervision and construction. Salary open. Apply to File No. 1258-V.

MECHANICAL ENGINEER, recent graduate, required in Montreal. Duties include draughting, building and piping layouts. Salary open. Apply to File No. 1259-V.

GRADUATE IN MECHANICAL ENGINEERING required by Canada's leading manufacturer of radio and electronic equipment in their research and development laboratory in Montreal. Applicant must have at least three years experience in mechanical design of radio transmitting or similar electrical equipment. Salary open. Apply to File No. 1262-V.

MISCELLANEOUS

MECHANICAL, CHEMICAL ELECTRONIC AND ELECTRICAL ENGINEERS also graduates in Engineering Physics required for armament research and development by a government establishment. Salaries open. Apply to File No. 1214-V.

GENERAL OPERATING SUPERINTENDENT required by Maritime public utility. Applicants must be thoroughly experienced in operation and maintenance of overhead electric distribution system. Salary open. Apply to File No. 1215-V.

GRADUATE ENGINEER preferably with training in engineering physics or civil engineer for several years work in the United Kingdom on defence problems. Applicant must have some knowledge of building construction. Age range 25 to 35 years. Salary open. Apply to File No. 1216-V.

SALES ENGINEER, age 30 to 40 years, required in Ontario for sale of anti-friction bearings. Experience in this field preferred. Salary open. Apply to File No. 1219-V.

GRADUATE ENGINEER required by Newfoundland Government with experience in road construction by contract. Salary open. Apply to File No. 1223-V.

GRADUATE ENGINEER with draughting and design experience on reinforced concrete, structural steel and conveying equipment. Field construction experience valuable but not absolutely necessary. Location, Montreal. Salary open. Apply to File No. 1224-V.

CIVIL OR MECHANICAL ENGINEER required for position of assistant shop superintendent in large structural steel fabricating plant in Montreal. Salary open. Apply to File No. 1231-V.

GRADUATE ENGINEER, with experience mostly in telephone planning, both inside and out, including repeater carrier and telephone equipment application, also some radio experience required by public utility in Ontario. Salary open. Apply to File No. 1235-V.

SALES ENGINEER required by prominent distributor of heavy equipment for forestry, road building and construction industries. Head offices in Montreal. Working knowledge of French and executive ability necessary. Salary open. Apply to File No. 1237-V.

SENIOR STRUCTURAL ENGINEER required in Montreal. Must have extensive experience in both field work and design. Estimating experience would be valuable. Salary according to qualifications. Apply to File No. 1242-V.

FIELD ENGINEER required for Montreal area for concrete and steel structure. Would also be responisble for line and grade work on job also technical supervision of the work. Salary open. Apply to File No. 1242-V.

MECHANICAL OR ELECTRICAL ENGINEER required for Junior position in production engineering division. Preferably applicant with interest in hydraulics as applied to machine tools. Location Ontario. Salary $270.00 to $325.00 per month. Apply to File No. 1244-V.

PLANT ENGINEER required by New Brunswick rayon mill. Applicant should have ten to fifteen years experience in electrical maintenance and repair. Machine shop experience also necessary. Must be capable of taking over and directing staff. Salary open. Apply to File No. 1254-V.

INSTRUCTOR qualified to teach elementary physics required for staff of a technical college in New York State. Preferably applicant with a masters degree in physics or equivalent training and some teaching experience. Salary open. Apply to File No. 1257-V.

SALES ENGINEER, around 30 years of age, preferably electrical background and experience with a utility or an electrical contractor or consulting firm. Should be familiar with transmission and distribution practice. Working knowledge of French. Location Montreal. Salary open. Apply to File 1261-V.

Combustion Engineer

For industrial concern near Montreal to take full charge of large boiler house and steam turbo generators. Technical knowledge, extensive operating experience and practical mechanical ability required. Permanent position and attractive salary. Apply to File No. 1290-V.

TOWNSITE DEVELOPMENT ADMINISTRATOR

University Engineering graduate, preferably Civil, able to administer and actively supervise all phases of townsite development and employee housing project; determine size and type of utilities; negotiate contracts for construction of houses and utilities; process mortgages with mortgage companies. Some experience in municipal affairs necessary and such experience more important than intimate knowledge of design details. Salary $7,500-$10,000 depending on experience Location: Alberta. Apply to File No. 1284-V.

TECHNICAL WRITER, graduate in engineering or science required by manufacturer of radio and electronic equipment in Montreal. Should have at least two years experience in writing instruction books for complex radio, radar or similar electrical equipment. Salary open. Apply to File No. 1262-V.

Situations Wanted

CHEMICAL ENGINEER, McGill, M.E.I.C., C.P.E.Q., married, age 36, perfectly bilingual, seeks position with possibilities for active and personal interest with established manufacturing, contracting or consulting firm in executive or professional position. Preferably in Montreal or vicinity. Nine years continued service with present employers, presently as plant and projects engineer. Wide trade connections. Engineering and administrative experience on operation, project studies and all stages of Realization: layout, equipment specifications and design, field administration, procurements, on wartime and recent projects. Apply to File No. 6-W.

MECHANICAL ENGINEER, Jr.E.I.C., P. Eng., University of Saskatchewan, 1941, age 31. Experience in mechanical inspection, production draughting, checking, mechanical design. Familiar with shop methods, working knowledge of work simplification. Desire change as opportunity for advancement limited. Willing to learn and will consider any type of work with reliable concern. Not averse to travel. Available upon 4 weeks notice. Apply to File No. 41-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., requires a part time position in the city of Hamilton with a consultant of reinforced concrete and structural steel. Interested in designing, checking or draughting. Will be available evenings and week-ends. Apply to File No. 43-W.

ELECTRICAL AND MECHANICAL ENGINEER, graduate of Australian University B.E. (Hons.), A.M.I.E. (Aust.) 27 years. Single. 6 years experience including electrical design on layout, illumination, auxilary plant, mechanical design, maintenance, supervision and production. Seeking experience and possible opportunity for post-graduate study over period of 5 years or more. Apply to File No. 59-W.

MECHANICAL ENGINEERING GRADUATE 1947, Jr.E.I.C., 4 years varied experience which includes; instrument man on dam construction and city engineering; power plant operation; substation construction and maintenance; instrumentation and maintenance engineer in chemical plant. Apply to File No. 60-W.

ELECTRICAL ENGINEER, S.E.I.C., A.I.E.E., B.Sc., in E.E. (Power Option). University of New Brunswick, 1949. Service with R.C.A.F. 3 years as aircraft electrician. Summers work with Northern Electric as dial installer. Age 26, single, bilingual. Desires work in power or sales. Available now. Will work anywhere. Apply to File No. 79-W.

ELECTRICAL ENGINEER, Associate I.E.E. Age 52. Married. 5 years pupil in English plant. 15 years supervising estimating and technical correspondence department of leading English manufacturers of power transformers and capacitors. 5 years with manufacturers' association. Library, technical writing and advertising experience. Presently located in Southern Ontario. Apply to File No. 81-W.

GRADUATE ELECTRICAL ENGINEER AND LAWYER. B.Eng. 1937, McGill, B.C.L. 1949, McGill, M.E.I.C. Age 35. Married. Ten years service with national electrical concern as sales engineer. Three years in R.C.A.F. as aeronautical engineer. Also took R.C.A.F. signals course. Position desired in industrial concern, preferably in administrative capacity where engineering experience and legal background would be an asset. Location immaterial. Available immediately. Apply to File No. 120-W.

ELECTRICAL ENGINEER, S.E.I.C., B.Sc. Alberta 1949. Age 29. Single. Desires employment in electronic field, would consider power field. 4½ years experience R.C.A.F. radar mechanic, 18 months, repair and assembly in radar factory. Available after September 15th. Apply to File No. 137-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. (Registered in Ontario and Quebec), age 50. Seeks technical representations, on salary or commission, in Ottawa or Eastern Canada. Specialities, light manufacturing and research projects. Apply to File No. 199-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Sc. (E.E.) Manitoba 1943. Age 28. Married. Electrical experience with R.C. signals and 3½ years general electrical experience in industry. Sales training. Presently employed but desires position offering wider scope and opportunity. Preferably Montreal area. Apply to File No. 925-W.

CIVIL AND ELECTRICAL ENGINEERING GRADUATE, M.E.I.C., with past experience covering engineering and building construction and maintenance, shop operation, heavy construction machinery sales and service. Past several years in managerial capacity. Seeks suitable change with greater responsibility in engineering or business. Apply to File No. 1266-W.

FIRE PREVENTION ENGINEER, graduate McGill 1936, M.E.I.C., P. Eng (Que.), with 13 years experience in fire prevention, safety and administrative work covering a wide variety of industrial operations. Work in production-management or maintenance line preferred. Will locate anywhere in Canada. Apply to File No. 1494-W.

MECHANICAL GRADUATE, M.E.I.C., P. Eng., age 42 with experience in mechanical design and plant maintenance, nine years as an industrial loss prevention engineer, desires permanent connection with senior responsibility. Ontario location preferred. Apply to File No. 1543-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C. Background of engineering: production, business organization, cost control and management. Age 36, 10 years experience, married, bilingual. firm in Montreal area. Would consider Would prefer permanent association with association with fellow engineer to start in manufacturing or other sphere of activity. Some capital available and a few projects in mind. Apply to File No. 1782-W.

CHEMICAL ENGINEERING GRADUATE M.E.I.C., McGill University, 1938. Age 36. Ten years experience including fine chemical production, plant operation and costing, industrial development surveys, raw material supply, planning and purchasing materials for plant construction and operating, plant and office organization. Available immediately. Apply to File No. 1947-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. (Ont.). Married. Presently employed. Seven years experience in Canada and the United States designing and supervising the installation and operation of heating, ventilating, air conditioning, refrigeration and dust collecting systems. Desires to improve position. Prefer Southern Ontario or Western Canada. Apply to File No. 2172-W.

ENGINEERING GRADUATE, M.E.I.C. B.A., M.Sc. Married. Age 52, bilingual Experience: 13 years teaching chemistry, mineralogy, geology, 9 years as mineralogist. Contemplates change soon for association with mining organizations in consulting capacity. Please submit propositions to File No. 2663-W.

MECHANICAL ENGINEER, Jr.E.I.C., Sask. '46. Age 24. Married, one child. Over two years experience in pulp and paper mill engineering, including design, supervision of construction, and executive reports. Available on two months notice for any interesting job which offers good experience and advancement according to merit. Will give serious consideration to any type of work except sales. Location unimportant. Apply to File No. 2795-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Alberta, 34 years of age, married, veteran R.C.E. Have held the following positions, instrumentman on airport construction, road and concrete materials assayer and inspector, superintendent on road construction program, assistant engineer in design office dealing in building design, timber, concrete and steel, superintendent in complete charge of building project. Wish to contact contractor (preferably in building construction) or consultant firm in Western Provinces. Available on reasonable notice. Apply to File No. 2875-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng. '44, age 28, bilingual. Experience as follows: Demonstrator in Department of Mechanical Engineering at leading university for one term. Also experience in large mass production outfit in following departments: Cast iron foundry, dry milling cast iron, oil milling, punch and die, screw, heat treating, forge, polishing, nickel and chrome, paint spray, assembly, tool room and production engineering department, etc. Prefers work on design and development of mass production industrial automatic machinery or any other interesting opportunities. Available after October 1. Apply to File No. 2882-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44, 7 years industrial experience, production supervision, planning, scheduling, specifications, incentive systems, methods, estimating, cost analysis, business experience, welding application and metallurgy, manufacture of equipment for chemical production industry. Desire position technical representative, sales, executive assistant, production manager. Avail 3 to 4 weeks. Apply to File No. 2920-W.

MECHANICAL ENGINEER, Jr.E.I.C., University of Saskatchewan 1944. Age 27. Married. Experienced in supervision of maintenance and construction in the paper industry and the textile industry. Desires position with responsibility and opportunity for advancement. Apply to File No. 2928-W.

GRADUATE DRAUGHTSMAN, DESIGNER, S.E.I.C., B.Eng. Desires a position in the structural design field, preferably reinforced concrete detailing and design. Age 23, McGill (Civil) graduate '48. More than a year's experience in structural steel and reinforced concrete detailing and design. Prefer employment in Montreal area, will consider good position elsewhere. Presently employed. Available on short notice. Apply to File No. 3026-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. (Quebec). Large experience in plant maintenance, production planning and machinery design. Good theoretical background. Excellent references from former employers. Seeking a responsible position in Montreal. Available on short notice. Apply to File No. 3045-W.

SALES ENGINEER, chemical engineer graduate, S.E.I.C. Laval '48. B.A.Sc., P.Eng. Age 26, single, bilingual. Desirous of obtaining a position as sales engineer, preferably in the Province of Quebec for a chemical or heating and ventilating firm. Available immediately. Apply to File No. 3064-W.

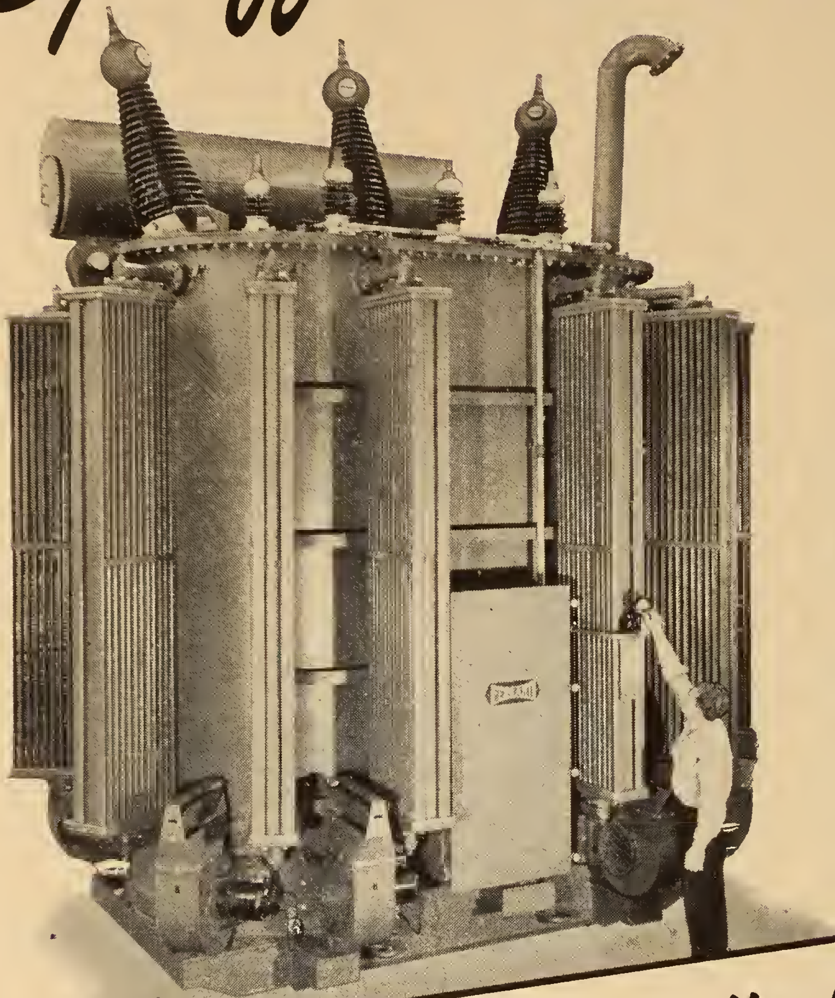
MECHANICAL ENGINEER, S.E.I.C., P. Eng. Ont., Toronto '48, married, family, age 35. 7 years draughting, shop experience, 1 year design engineer, in pulp and paper line and heavy industrial equipment. Interested in plant engineering or design, desires permanent position with responsibility. Apply to File No. 3180-W.

ELECTRICAL ENGINEER, Jr.E.I.C. 2½ years technical officer in Army, 3 years varied industrial experience, including production planning and control, work simplification, and cost accounting. Courses completed in business administration. Interested in sales work. Desires position with small or medium size company. Apply to File No. 3181-W.

ELECTRICAL ENGINEER, S.E.I.C., A.P.I., B.Sc. (E.E.) University of Saskatchewan 1949. Age 25. Married. Experience includes electrical contracting, wireless and radar in R.C.A.F. and maintenance of hydro plant. Desire employment in transmission or distribution. Apply to File No. 3238-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C., desires position in pulp, paper mill or mining. Two years pre-graduation bench work in machine shops toolmaking and light metal manufacturing. 16 months as tool and process engineer for Westmount tool-works, D.I.L.; 8 months as telephone equipment engineer; 6 months designing structure for Auto-plane Company, Dorval; 16 months with Dominion Engineering as process engineer for manufacture of diesel engines. Since March 1947 have been engaged doing plant and production layouts for a pulp mill. This has involved structural design, reinforced concrete, foundation, pumps and piping and conveyors, machine design, and general process layouts. Apply to File No. 3240-W.

Specify-FERRANTI



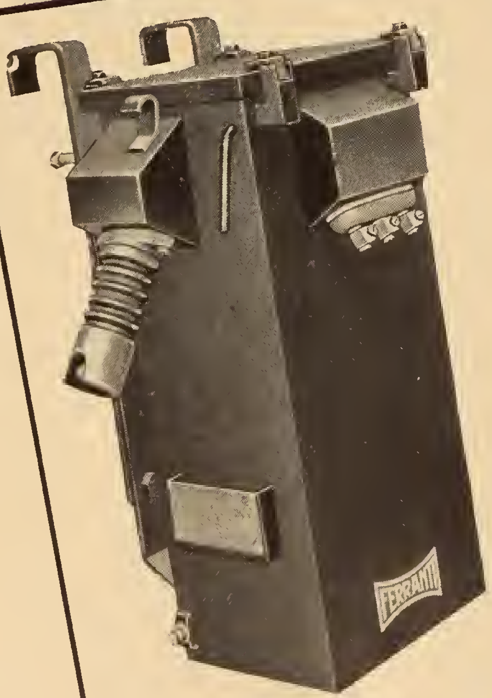
Power Transformers

Among the many thousands of Ferranti power transformers in service throughout the world, well over 3,000,000 kv-a. have been installed in units of 60,000 kv-a. and larger.

In Canada Ferranti builds transformers in capacities up to 10,000 kv-a. and 132,-000 volts (depending on frequency, etc.) with this background of experience in design and manufacture adapted to Canadian requirements.

Specify Ferranti for your next power installation and get maximum satisfaction for many years to come.

Illustrated: A 5000 kv-a., 115000-12000/24000 volt, three-phase, 25 cycle, oil-insulated, forced-air cooled Ferranti power transformer.



Distribution Transformers

Ferranti standard distribution transformers have proved their superiority for utility distribution systems and industrial lighting and power application.

Ferranti distribution transformers are suitable for platform mounting, and in many ratings, are supplied with brackets for mounting hangers or other pole-mounting accessories.

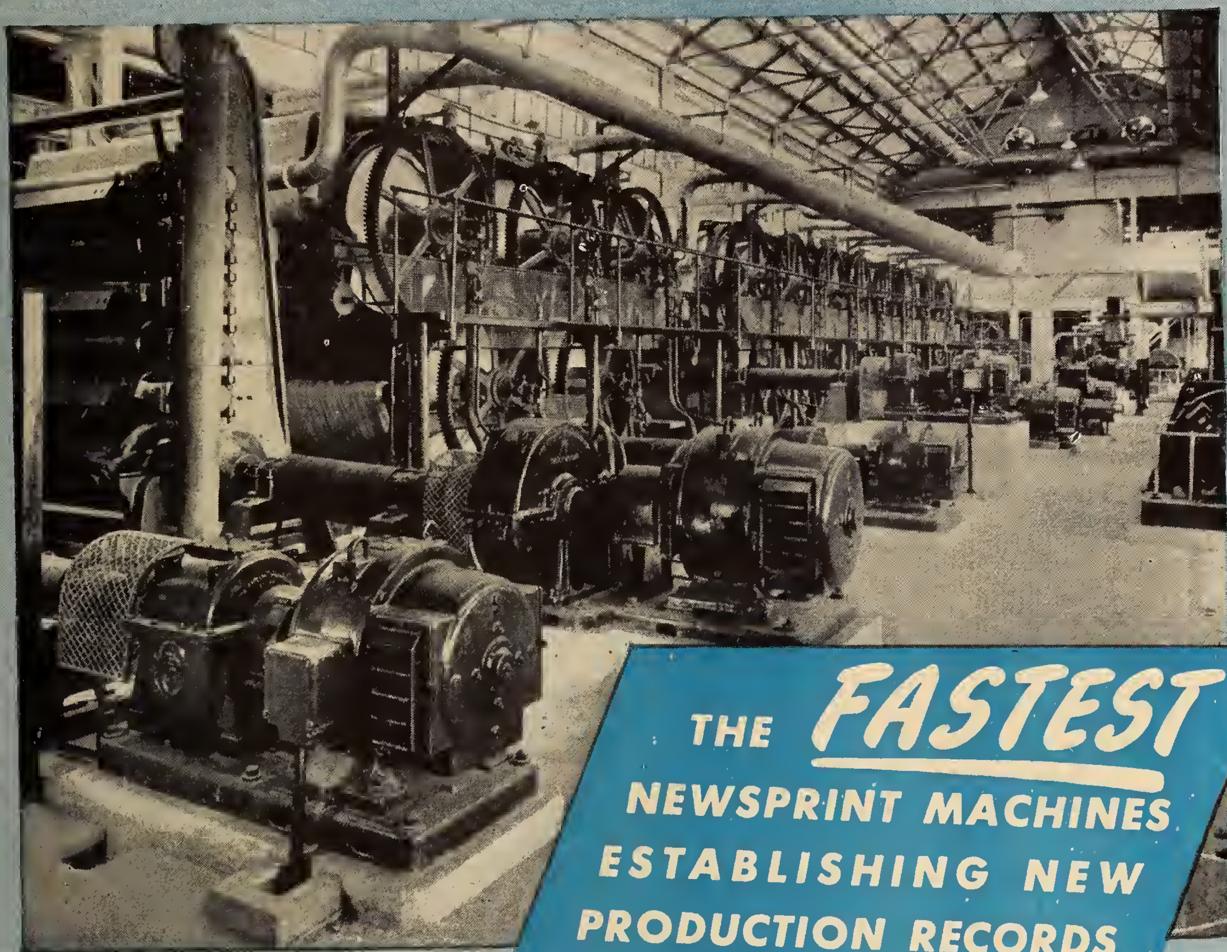
They are also equipped with stud-type bushings which have extra capacity and provide a quick, easy, shake-proof cable connection.

Large or small, standard or special, no better transformers are available!

Northern Electric
COMPANY LIMITED

A NATIONAL ELECTRICAL SERVICE

26 BRANCHES ACROSS CANADA



THE *FASTEST* NEWSPRINT MACHINES ESTABLISHING NEW PRODUCTION RECORDS USE . . .

HARLAND DRIVES

The Harland Drive, maintaining its basic principle, now has true anticipatory control giving several times greater sensitivity than was previously possible, together with improved layout. Draw control units are grouped together and remotely located. Only motors and speed reducers are in the drive aisle.

Harland – the World's Finest Paper Machine Drive

9-6

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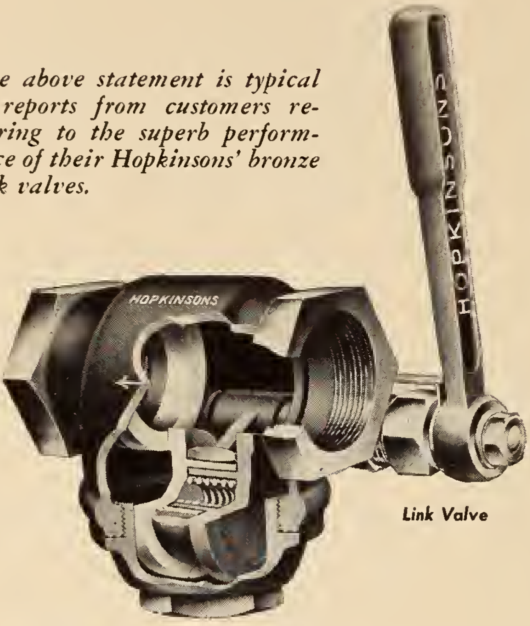
Opened Half a Million Times...Still Steam-Tight

The above statement is typical of reports from customers referring to the superb performance of their Hopkinsons' bronze link valves.



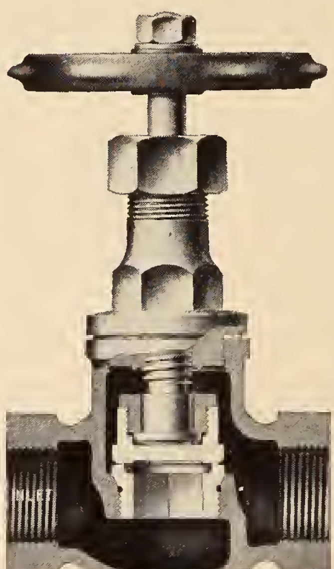
Link Valve

TRY HOPKINSONS' bronze valves for services which are too tough for ordinary valves — where a superior type of valve is required.

Hopkinsons' valves are fitted with "Platnam" seats and discs which are almost impervious to corrosion or erosion. These valves will remain leak-proof long after ordinary valves have failed.

Some of our valves have been in service for more than ten years under most severe operating conditions. They are still in good order and do not leak.

Bronze valves are stocked in Montreal in sizes from ½" to 2" for pressures up to 250 psi. (steam) and 350 psi. (water, oil, air). They are available in two styles: the parallel slide link valve and the general purpose globe valve. Ask for our Hopkinsons' leaflets 4804 and 4902.



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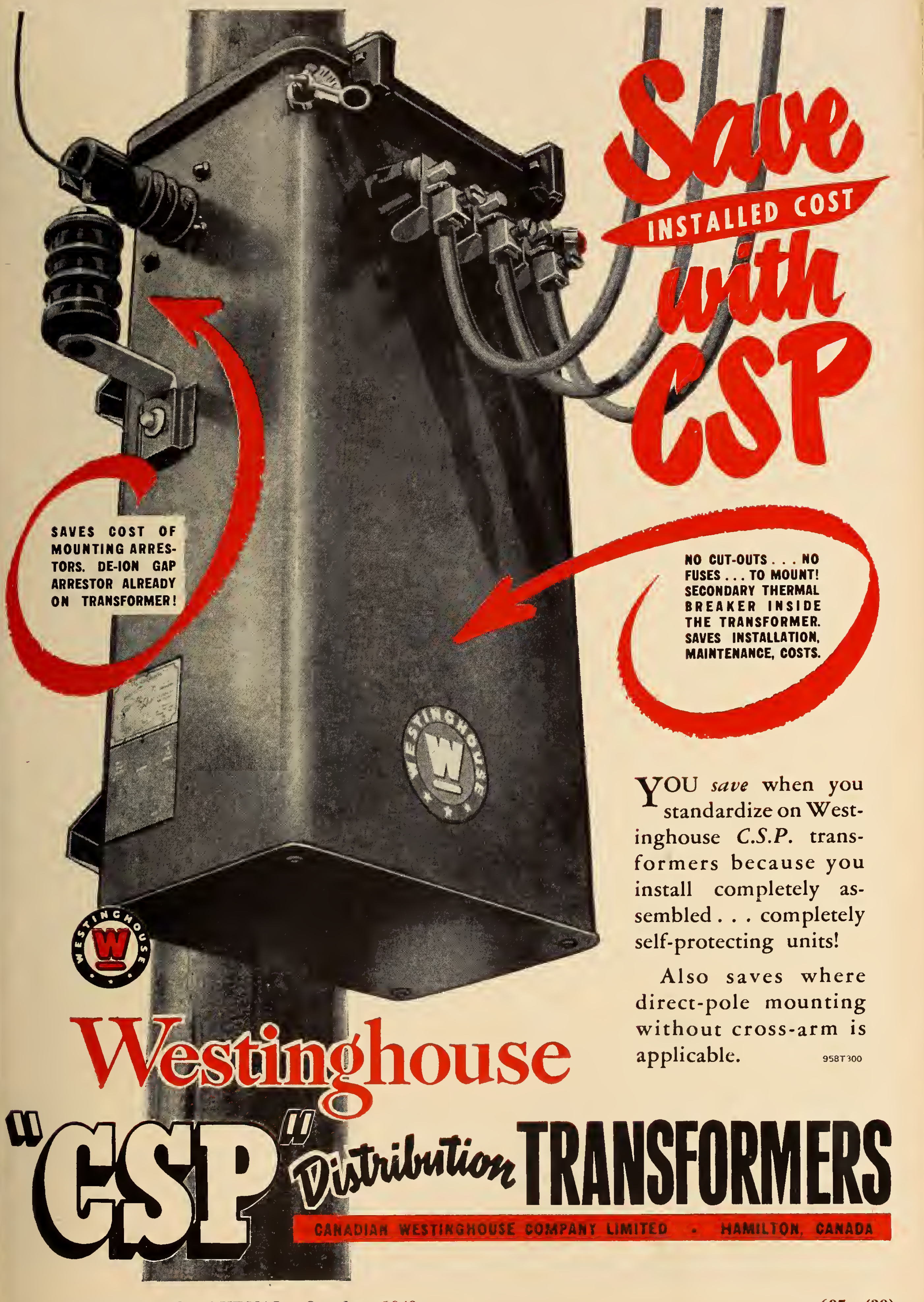
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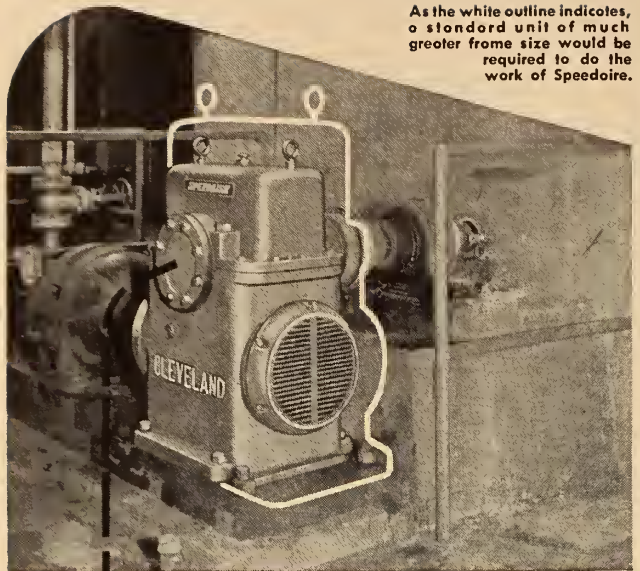
As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.



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THIS Speedaire unit drives a 54″ stainless steel propeller in a Bleacher Tank in one of the mills of a prominent eastern paper company. The propeller moves 45,000 gallons of solution, at the rate of 100 feet per minute.

To handle this job satisfactorily would have required a conventional worm gear drive more than double the size of Speedaire, weighing 55% more. And the standard unit would have cost an extra $471.50—40% more than Speedaire.

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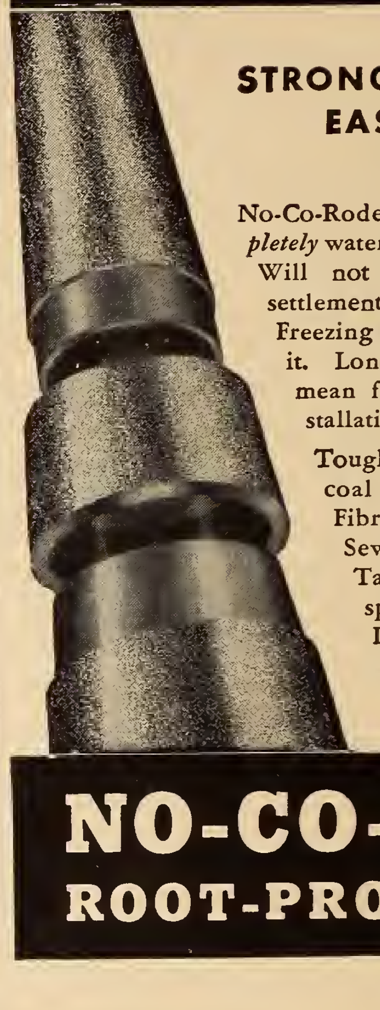

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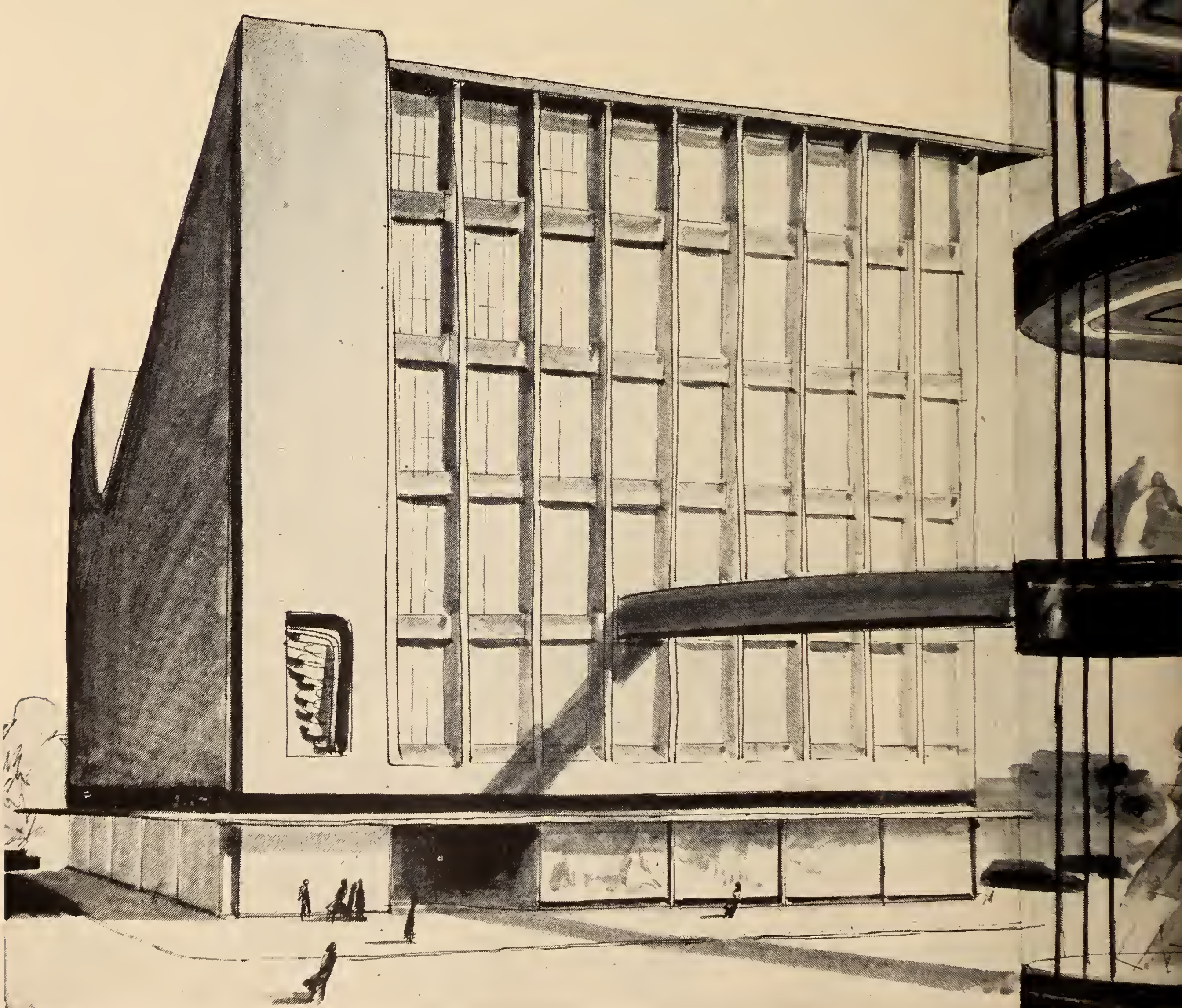

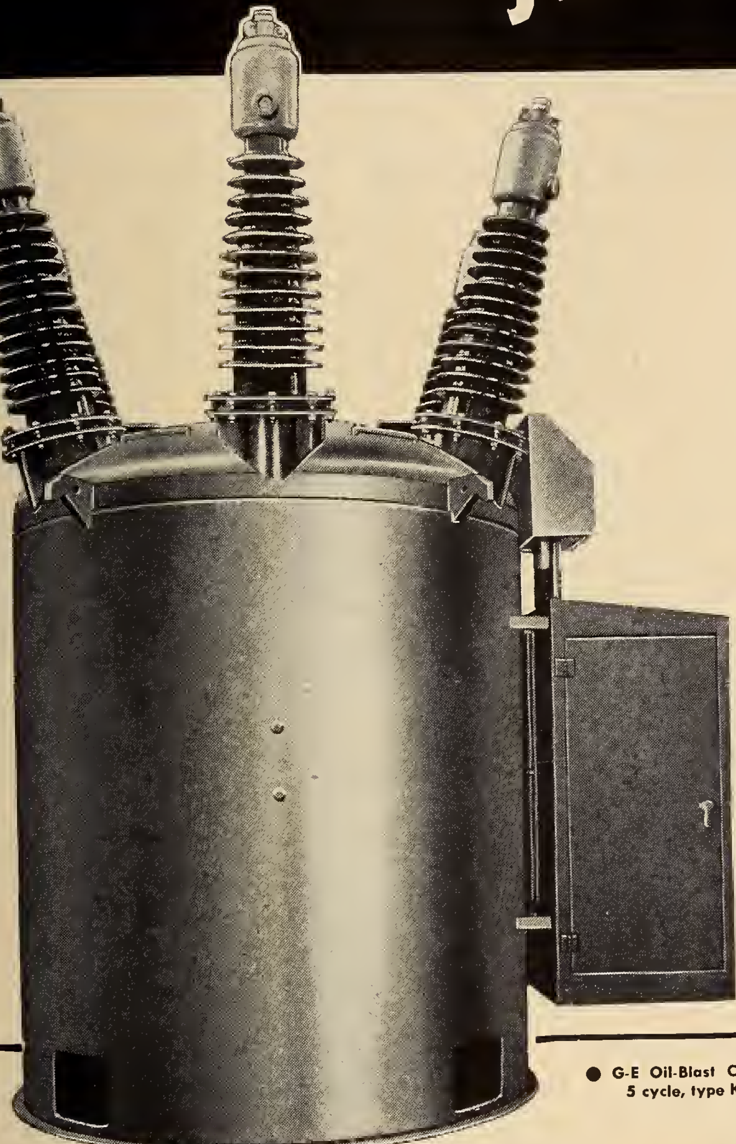

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BOOK REVIEW

AN INTRODUCTION TO ENGINEERING ECONOMICS

C. R. Young, M.E.I.C. Toronto, University of Toronto Press, 1949. 160 pp., illus., cloth, 6¼ x 9¼ in., $3.00.

*Reviewed by Lt. Col. L. F. Grant, M.E.I.C.**

Dean Young's book is the outcome of many years teaching engineering economics to senior students and should be a valuable text for such courses.

After stating the problem and its relationship to the engineer, the book deals with costs, financing an enterprise, interest, retirement of debt, depreciation, economic choice, critical costs, and concludes with a chapter on valuations and appraisals.

Throughout, the author emphasizes the importance of extraneous factors such as changing markets, shifts in population, new inventions, and political developments and shows how these may influence economic decisions. This is in marked contrast with the treatment of engineering economics, by some writers, as a matter of straightforward mathematics.

The chapter on critical costs is particularly interesting. This deals with problems such as the following: when plant which has still many years of life becomes uneconomical because of mounting repair bills, or the introduction of more modern equipment by competitors, what output of product will give minimum cost, and when is the point of diminishing returns reached.

Many instances of actual cases and decisions are given, some of them indeed being live questions today. As most of these are taken from Canadian experience they should be especially interesting and useful to Canadian students.

There are many problems, both illustrative and for solution, and a good bibliography is appended.

*Assoc. Professor, Queen's University, Kingston, Ont.

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS. PAPERS:

Detection of Winding Failures during Impulse Tests on Transformers by Oscillographic Methods, *E. C. Rippon and G. H. Hickling.*

Details of experimental work done by the authors on a new fault detection technique proposed in the U.S.A. A brief outline is given of the theoretical principles on which it depends, followed by a review of its practical application to routine impulse testing.

Domestic Appliances—Test Reports, Re-Conditioning and Servicing, *H. Hobbins.*

Deals with problems relating to the new circumstances arising out of nationalization of the Supply Industry.

Electric Traction and Diesel-Electric Traction on the Netherlands Railways, *H. J. van Lessen.*

Gives information on the repairing of damage done to the Netherlands Railways during the war, and on the post-war extension of the electrified system. A detailed comparison is given of electric and Diesel-Electric traction.

Measurement of Light and Colour, *G. T. Winch.*

Briefly surveys the progress made since 1900 in the methods of deriving and maintaining the unit of light. This work has led to the development of the primary standard of light and the "New Candle" unit now to be called the Candela.

Parasitic Forces Existing in Induction Watthour Meters, *G. F. Shotter.*

Describes research on an experimental technique to prevent excessive wear due to parasitic forces on bearings of meters. This should lead to production of meters which do not cause vibrational wear.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Advanced Calculus for Engineers:
F. B. Hildebrand. New York, Prentice-Hall, 1949. 594 pp., illus., cloth.

Aeronautical Charts; Standards and Recommended Practices:
International Civil Aviation Organization. Montreal, ICAO, 1949. 39 pp., illus., paper.

Calcul du Béton Armé à la rupture; Compression, Traction, Flexion simple et composée:
A. Guerrin. Paris, Dunod, 1949. 335 pp., illus., paper.

Extrapolation, Interpolation and Smoothing of Stationary Time Series:
Norbert Wiener. New York, Wiley, c1949. 163 pp., cloth.

Geology for Engineers:
Joseph M. Trefethen. New York, Toronto, Van Nostrand, 1949. 620 pp., illus., cloth.

Hot-Tinning:
W. E. Hoare. Greenford, Tin Research Institute, 1948. 112 pp., illus., paper.

Institution of Engineers (India). Silver Jubilee:
S. B. Joshi ed. Bombay, S. B. Joshi, 1946. 163 pp., illus., cloth.

Principles and Practice of Radar:
H. E. Penrose. London, George Newnes, 1949. 692 pp., illus., cloth.

Refrigerating Data Book:
American Society of Refrigerating Engineers. New York, American Society of Refrigerating Engineers, c1949. 692 pp., illus., cloth.

TV Picture Projection and Enlargement:
Allan Lytel. New York, John F. Rider, c1949. 179 pp., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ETC.

Canadian Institute of Mining and Metallurgy and Mining Society of Nova Scotia:
Transactions; Volume 51.

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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

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All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

Non-members may consult the library, but may not borrow material.

Chalmers Tekniska Hogskolas (Chalmers University of Technology), **Handlingar** (Proceedings):

No. 83—Ionospheric Effects of Solar Flares 1948, O. E. H. Rydbeck and D. Stranz.—No. 85—Surface Tension Anomalies in Melts Containing Lead Oxide and Boron Oxide, Solve Carlen.

Institution of Engineers (India) Bombay Centre:

Twenty-Seventh Annual Report 1947-48, and Papers to be read at the Twenty-Seventh Annual Session.

TECHNICAL BULLETINS, ETC.

Edison Electric Institute. Publications:

No. R-1—Boilers and Combustion 1948. —No. R-9—Branch Circuit Overcurrent Protection for Low-Voltage Circuits of 30 Amperes or Less Used for Interior Wiring.—No. R-13—Turbine and Boiler Overhaul Practice.

Institute of Metals. Reprints from "Journal", V. 17, pt. 9, 1949:

An Experimental Investigation by a Dynamical Method of the Variations of Young's Modulus with Temperature, G. E. Bennett and R. M. Davies.—Analysis of Corrosion-Time Curves, F. A. Champion and M. Whyte.—Elimination by Lythium of Bismuth Embrittlement in Deoxidized Coppers and Copper Alloys, W. A. Baker and A. P. C. Hallowes.—Modern descriptive Theories of Precipitation Processes, H. K. Hardy. —Some Effects of Silicon on the Tendency to Cracking in Aluminium-Copper-Magnesium Alloys of High Purity, W. I. Pumphrey and D. C. Moore.

Institution of Mechanical Engineers. Paper:

Design and Operation of the Parsons Experimental Gas Turbine, A. T. Bowden and J. L. Jefferson.

Princeton University. Industrial Relations Section:

Bibliographical Series:

No. 80—Trade Union Library 1949, Hazel C. Benjamin.

...Selected References:

No. 29—Wages, Prices, and Profits.

Statens Skeppsprovningsanstalt (Swedish State Shipbuilding Experimental Tank) **Meddelanden** (Publications):

Resistance of a Barge with the Bottom Air Lubricated, Hans Edstrand and Ragnar Rodstrom.

University of Illinois. Bulletin Series:

No. 380—Fatigue Strength of Fillet-Weld, Plug-Weld, and Slot-Weld Joints Connecting Steel Structural Members, Wilbur M. Wilson and others.—No. 381—An Investigation of the Backwater Profile for Steady Flow in Prismatic Channels, Wallace M. Lansford and William D. Mitchell.—No. 383—Progress Report on Performance of a One-Pipe Steam System in the I-B-R Research Home, Warren S. Harris.

...Circular Series:

No. 55—Contributions to Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering held at Rotterdam, the Netherlands, June, 1948.—No. 56—Papers Presented at the First Short Course on Industrial Packaging and Materials Handling, held at Chicago, October 4-7, 1948.

...Reprint Series:

No. 42—First Progress Report of a Laboratory Investigation of Roadbed Stabilization, Ralph B. Peck.—No. 43—Progress Reports of Investigation of Railroad Rails, Joint Bars, and Manganese Steel Casting, R. E. Cramer and R. S. Jensen.—No. 44—Present Status of the Development of Hand-Fired Smokeless Coal Heaters, Julian R. Fellows.

PAMPHLETS, ETC.

Bibliography on Sprays:

Kalman J. DeJuhasz, compiler, Texas Co., New York, 1948.

Code of Practice for Simply Supported Steel Bridges:

Institution of Civil Engineers and Institution of Structural Engineers, Westminster, 1949.

Directory of Special Libraries in Montreal:

Montreal Special Libraries Association, Montreal, 1949.

Emulsions and Detergents:

Carbide and Carbon Chemicals Corporation, New York, 1949.

Etancheite des Toitures-Terrasses; Procédés Multicouches:

Institut National Technique de l'Etancheite, Paris, 1949.

Iceway:

L. K. Sillcox, University of Michigan, 1949.

Industrial Uses of Radioactive Materials; a Selected Bibliography:

Arthur D. Little, Cambridge, Mass., 1949.

Information Booklet of Newfoundland and Labrador:

Newfoundland Industrial Development Board, Saint John's, Newfoundland, 1946.

Site Supervision of Concrete Work:

Institution of Structural Engineers, London, 1949.

Testing and Inspection:

J. T. Stacy, Battelle Memorial Institute, Columbus, 1949.

Wind Resistance of Lattice Girder Bridges:

E. Ower, Institution of Civil Engineers and Institution of Structural Engineers, London, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

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AMERICAN WELDING SOCIETY. STANDARDS:

A3.0-49—Standard Welding Terms and their Definitions. *$1.00.*

This standard contains more than 500 terms and 57 illustrations with the purpose of formulating a suitable, standard terminology for welding, and to improve the terms and definitions relating to the older welding processes.

A3.1-49—Standard Master Chart of Welding Processes and Process Charts. *35c.*

These charts are a part of the above standard and are meant to be studied in reference to the terms and definitions.

BIBLIOGRAPHIC SURVEY OF CORROSION; A COMPILATION OF CORROSION ABSTRACTS, 1945:

R. D. Misch, J. R. Waber, H. J. McDonald. Houston, Texas, National Association of Corrosion Engineers, 1948. 129 pp., 11¼ x 8¾ in., cloth, $4.00 to N.A.C.E. members, $5.00 to others.

This book contains approximately 1,100 references to published articles relating to corrosion, and 170 references to patents. The abstracts are divided into groups: types of attack, investigations in corrosion; effects of specific media; effects in specific equipment; resistance of materials; methods of prevention; coatings; removal of corrosion products; and general and miscellaneous considerations.

BUILDING FOR MODERN MAN: A SYMPOSIUM:

T. H. Creighton, editor. Princeton, N.J., Princeton University Press; Toronto, Saunders, 1949. 219 pp., 8¾ x 5¾ in., cloth, $4.50 in Canada.

This is an edited and revised report of a conference held at Princeton University in 1947. The first three sections, on "The Social Basis of Design", "Limitations and Possibilities" and "Form", have to do with analytical inquiry. The fourth is devoted to education. The fifth and sixth, on "planning" and "space use", are concerned with the application of principles. the seventh is a personal debate on inspiration and pragmatism; and the eighth is a summary and drawing of conclusions.

BRITISH STANDARDS INSTITUTION. STANDARDS:

B.S. 1523: 1949—Glossary of Process Control Terms. *2/6.*

Section Two of a comprehensive glossary which is planned to cover terms used in automatic controlling and regulating systems of the closed-loop type.

B.S. 1538: 1949 — Intrinsically-Safe Transformers for Bell-Signalling Circuits Primarily for Use in Coal Mines. *2/-.*

Prescribes a standard single phase double-wound transformer, for supplying current to an intrinsically-safe bell signalling circuit, for use where there may be a risk of fire-damp in the surrounding atmosphere.

B.S. 1542: 1949—Equipment for Eye and Face Protection during Welding. *2/-.*

Covers spectacles, goggles, facemasks, helmets, hand-shields and screens: includes recommendations on the use of these types of equipment and also deals with the question of screening welding operators to avoid injury and distraction to other workers in the shop.

CONSULTING ENGINEER YEAR BOOK 1949:

Princes Press, London, 1949. 270 pp., illus., 8½ x 6 in., cloth.

This reference book contains a list of abbreviations; a selected list of British Standards Institution standards; a section of consulting engineering firms in Great Britain, with their addresses and telephone numbers; work rates for heating, electrical, and building work; a directory of trade marks; electricity voltages of supply undertakings in Great Britain; a list of British engineering societies with details about each; a survey of engineering in 1948; and much other information.

INSTRUMENT MANUAL:

United Trade Press Ltd., London, 1949. 548 pp., illus., 11¼ x 8¾ in., cloth, 70/–.

The object of this book is to provide general information of value to all concerned with industrial instruments. It is a survey of the great range of instruments in general use: details of relevant literature; names of suppliers; a complete directory of manufacturers and organizations directly interested in the subject; and periodicals dealing with current instrumentation problems. It is intended for those who choose the instruments, those who place the orders, those who install and subsequently maintain the instruments, and the plant operatives who actually use them.

LOCOMOTIVE WHEEL BALANCING:

G. W. McArd. Manchester, Emmott, 1949. 28 pp., illus., 7 x 5 in., paper, 2/–. (Mechanical World Monograph No. 44.)

This pamphlet deals with wheel systems and balancing methods in general, and specifically in two, three, and four cylinder engines. The author has sought to simplify the treatment of the whole subject, giving the practice on the leading railway systems in Great Britain in regard to the proportion of reciprocating weights to be balanced.

TELLING THE STORY OF ENGINEERING RESEARCH:

Engineering College Research Council of the American Society for Engineering Education. Iowa City, Iowa, Office of the Chairman, E.C.R.C., at the State University of Iowa, 1949. 43 pp., illus., 9 x 6 in., paper, 50 cents.

"Telling the Story of Engineering Research", being the proceedings of the council's winter meeting held in Washington, D.C., November 1948, is a booklet on science writing. It contains the full texts of seven addresses given before the meeting by nationally known editors and science writers. It tells how engineers and scientists may present the story of their activities through all the various media available. Of special interest to public-spirited engineers and scientists, and also of interest to public relations and advertising staffs whose task it is to help translate scientific accomplishments into more widely understood terms.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

ADVANCES IN ELECTRONICS, Volume I:

Edited by L. Marton. Academic Press, New York, 1948. 475 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $9.00.

This first volume of a projected yearly publication contains critical and integrated reviews of specific topics in the field of physical electronics and in selected fields of engineering electronics: The ten articles in this book were written by specialists and deal with oxide coated cathodes, secondary electron emission, television pick-up tubes, deflection of beams of charged particles, mass spectroscopy, particle accelerators, ionospheric research, cosmic radio noise, the FM broadcast band, and electronic aids to navigation.

DESIGN AND CONSTRUCTION OF REINFORCED CONCRETE BRIDGES:

A. W. Legat, G. Dunn and W. A. Fairhurst. Concrete Publications Ltd., 14 Dartmouth St., London, S.W.1, England, 1948. 515 pp., illus., diagrs., charts, tables, 9¼ x 6¼ in., cloth, 30s.; by post 31s.

Of value to designers, contractors and students, this book provides the theory, practical design, and modern methods of construction of reinforced concrete bridges of all types. Formulae, charts, tables and data for the rapid preparation of complete calculations and estimates of cost are given. All stages of construction are fully illustrated. Numerous examples of actual structures and reproduction to a large scale of many working drawings are included.

DYNAMIC PRINCIPLES OF MECHANICS:

D. R. Inglis. Blakiston Company, Philadelphia, Pa., and Toronto, Canada, 1949. 174 pp., diagrs., 9¼ x 6¼ in., linen, $4.00.

This study of classical mechanics is written as a text for college juniors and seniors who have already studied calculus and general physics. Primarily a discussion of fundamental principles, there is a particular emphasis on dynamics, and the concept of vectors is introduced early and used often. Problems for student solution are in the text following the related material.

ELECTRON TUBES, 2 Vols.: Vol. 1, 1935-1941; Vol. 2, 1942-1948:

Edited by A. N. Goldsmith and others, published by RCA Review, Radio Corporation of America, RCA Laboratories Division, Princeton, New Jersey, March, 1949. Vol. 1, 475 pp., Vol. 2, 454 pp., illus., diagrs., charts, tables, 9 x 6 in., cloth, $2.50 each Vol. plus 20c postage.

This two-volume set presents 40 selected papers reprinted from leading journals, together with some 50 additional summaries. Each volume is divided into four sections: general, transmitting, receiving, and special. The appendixes contain a further bibliography on vacuum tubes, thermionics, and related subjects by RCA authors. A reference list of pertinent RCA Application Notes is also included.

ELEMENTS OF AERODYNAMICS OF SUPERSONIC FLOWS:

A. Ferri. The Macmillan Company, New York, Toronto, 1949. 434 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., cloth, $10.00.

Presented from a practical engineering point of view, this book explains the theoretical fundamentals of both two and three-dimensional flow. It shows in detail the application of theory to such aeronautical engineering problems as instruments, diffusors, and wing design. Theory is explained as clearly and simply as possible, and many examples of analysis for particular problems are included. There is also new material on various topics that will be of value to both design engineers and those working on the theoretical aspects of high-speed flow.

INFLUENCE OF CERTAIN FACTORS ON THE PERFORMANCE OF SHELL-TYPE BOILERS:

Compiled by E. G. Ritchie. British Coal Utilization Research Association, London, S.W.1, and Randall Road, Leatherhead, Surrey, England, 1948. 152 pp., illus., diagrs., charts, tables, 9¾ x 7¼ in., paper, 12s.6d.

This report is mainly concerned with shell-type boilers for industrial purposes, i.e., Lancashire and Economic boilers and their firing equipment. It is divided into five parts: the influence of excess air, the influence of rating, the influence of fuel characteristics, the measurement of flue-gas temperature, and surface heat loss in shell boilers.

MATHEMATICS OF CIRCUIT ANALYSIS, Extensions to the Mathematical Training of Electrical Engineers. (Principles of Electrical Engineering Series.)

E. A. Guillemin. Technology Press, Massachusetts Institute of Technology; John Wiley & Sons, New York; Chapman & Hall, London, 1949. 390 pp., diagrs., tables, 9¼ x 6 in., cloth, $7.50.

This volume contains a collection of a variety of principles and methods essential to a thorough understanding of electrical network theory. The first four chapters bring together topics in advanced algebra. The following chapter on vector analysis precedes the discussion of functions of a complex variable. The last chapter is concerned with Fourier series and integrals. Problems are included at the end of each chapter.

NUMERICAL METHODS OF ANALYSIS IN ENGINEERING (Successive Corrections):

H. Cross and others, a Symposium a. Illinois Institute of Technology, Chicago, Ill., arranged and edited by L. E. Grinter. Macmillan Co., N.Y., Toronto, 1949. 207 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., cloth, $5.80.

This volume contains papers on methods and techniques of numerical analysis which are applicable in many fields of engineering and science. Divided into four sections, the first three discuss numerical methods based upon physical concepts, numerical solutions of equations for state of stress, and applications of numerical methods to heat transfer. Surveys and bibliographies of numerical methods make up the final section.

PUMP HANDBOOK:

V. C. Finch. National Press, Millbrae, California, 1948. 202 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $4.00.

This book is designed to make it easy for any one concerned with pumps to acquire sufficient knowledge to enable him to select the right pump, to know when a pump is properly installed, and to keep it operating successfully and economically. Centrifugal, rotary and reciprocating pumps are considered, as well as boiler feed, propeller, mixed-flow, peripheral, and deep well turbine pumps among other specialized adaptations.

STEEL AND ITS HEAT TREATMENT, Volume III. Engineering and Special-Purpose Steels:

D. K. Bullens and the Metallurgical Staff of the Battelle Memorial Institute. 5th ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 606 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50.

This final book of a three-volume set correlates the known facts about the more important alloy or special steels and their heat treatment with fundamental principles. Presented in three sections, the book treats in order engineering alloy steels, constructional alloy steels for heat treating, and special steels. The effect of heat treatment on the suitability of these steels for various uses are analyzed as are the possibilities of utilizing alternate steels.

SYMPOSIUM ON MINERAL AGGREGATES (1948). (Special Technical Publication No. 83):

American Society for Testing Materials, 1916 Race St., Philadelphia, Pa., 1948. 233 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, $3.00; cloth, $3.65. (To A.S.T.M. members, paper, $2.25 and cloth, $2.90.)

The papers and discussions presented in this publication deal with the distribution, characteristics and uses of mineral aggregates. Many papers contain extensive bibliographies, and historical background is presented when needed. Distribution, processing and sampling are considered as well as tests and mineralogical characteristics, aggregates for Portland-cement concrete, bituminous construction, and other uses. Fields which need to be studied are indicated.

WASTE-HEAT RECOVERY FROM INDUSTRIAL FURNACES:

Institute of Fuel, London; Chapman & Hall, Ltd., London, 1948. 384 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 35s.

Based on a series of papers presented to the Institute of Fuel, this book is devoted to the results of studies made on means whereby the heat leaving industrial furnaces in the flue gases may be recovered and made to perform useful work. Attention is focused on regenerators and recuperators and on boilers of the type which use the waste heat for raising steam. Much heat transfer data are given.

WELDING METALLURGY, Iron and Steel:

O. H. Henry and G. E. Claussen, revised by G. E. Linnert. 2 ed. American Welding Society, 33 West 39th St., New York, 1949. 505 pp., illus., diagrs., charts, tables, 7¾ x 5¼ in., fabrikoid, $2.50.

Intended for use by those in the welding industries, this book discusses the welding metallurgy of specific materials and the effect of different elements on the welding process. Over 150 pages have been added to this edition containing new information on recently introduced processes and more information on the metallurgy of specific materials. A short bibliography has been added to each chapter, and an index has been added to the book.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

CENTRIFUGAL AND OTHER ROTO-DYNAMIC PUMPS:

H. Addison. Chapman & Hall, Ltd., London, 1948. 492 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, 36s.

This book deals, in a general way, with most of the questions likely to concern designers, makers and users of centrifugal pumps and allied machinery. The text material is divided into four sections: principles, design and construction, performance, and installation. It covers the entire range of centrifugal, screw, and propeller pumps. Forty-eight worked-out examples of pump and pumping-plant problems are appended, with specific reference to the pertinent text paragraph.

GRAIN CONTROL IN INDUSTRIAL METALLURGY:

J. E. Burke, R. L. Kenyon, H. Burghoff, J. T. Hobbs. American Society for Metals, Cleveland, Ohio, 1949. 279 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

Four lectures presented at the 1948 National Metal Congress are included, as follows: fundamentals of recrystallization and grain growth, recrystallization and grain control in ferrous metals, recrystallization and grain control in copper and copper alloys, grain control in wrought aluminum and magnesium products. A glossary of terms used is provided.

PHYSICAL ASPECTS OF COLOUR:

P. J. Bouma. N. V. Philips Gloeilampenfabrieken, Eindhoven, Netherlands. Distributors for U.S.A. and Canada, Elsevier Publishing Co., New York; for Great Britain, Cleaver Hume Press Ltd., London, England, 1948. 312 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.60. (Philips Technical Library).

Approaching the subject from the viewpoint of experimental physics and illuminating engineering, this book surveys the theory of colorimetry and its applications to practical problems. Following an introductory discussion of classification is a consideration of the theoretical basis of color measurement and color calculation. The practice of color measurement is then described. The final chapter surveys the aspects of science and technology in which practical applications are made. A knowledge of high school mathematics and physics is assumed, and a bibliography is included.

PILING FOR FOUNDATIONS:

R. R. Minikin. Crosby Lockwood & Son, Ltd., London, 1948. 196 pp., illus., diagrs., charts, tables, 9 x 5½ in., cloth, 15s.

Useful to students, designers, and field engineers, this book presents those factors of economic design and practical efficiency derived from the author's experience and from the successful works of colleagues. Practical examples of the design and use of piling are given from modern practice, particularly of constructions which are usually productive of site difficulties. They include industrial buildings, bridges, marine works, cofferdams, and a variety of ancillary works.

PLASTIC DEFORMATION, PRINCIPLES AND THEORIES:

L. N. Kachanow and others, edited by H. H. Hausner. Mapleton House, Publisher, 5415 Seventeenth Ave., Brooklyn 4, N.Y., 1948. 192 pp., diagrs., charts, tables, 8¾ x 5½ in., linen, $8.00.

This book contains translations of five papers on general theory by the Russian scientists, N. M. Beliaev, A. A. Ilyushin, and L. N. Kachanow. Also in the volume are two papers describing the research work of W. Mostow and A. N. Gleyzal. Their research is primarily concerned with the deformation of thin circular and rectangular plates. In these last two papers is a brief history of the previous work done in the field.

ROCKET DEVELOPMENT, LIQUID-FUEL ROCKET RESEARCH, 1929-1941:

R. H. Goddard, edited by E. C. Goddard and G. E. Pendray. Prentice-Hall, New York, 1948. 291 pp., illus., diagrs., tables, 9¼ x 6 in., cloth, $6.50; text ed. $4.90.

Of interest to engineers in rockets and jet propulsion, this book presents the Goddard data on experiments performed from 1929 until 1941. They comprise the entire Goddard rocket development from the first liquid-fuel rocket flight until the beginning of World War II.

STRENGTH OF MATERIALS:

C. O. Harris. American Technical Society, Chicago, Ill., 1949. 214 pp., illus., diagrs., charts, tables, 11¼ x 8 in., cloth, $4.90.

Prepared not only for engineering students but also for others in industry who need such basic knowledge, this book presents a simplified discussion of the strength of materials. Each topic is developed in a step-by-step manner, and a set of practice problems follows each topic. Early chapters provide the needed background. The properties, advantages and disadvantages of many materials are covered in detail. Topics receiving special attention include spot welding, fatigue in metals, and new materials which are currently being used in industry.

TRAINING EMPLOYEES AND MANAGERS:

E. G. Planty, W. S. McCord and C. A. Efferson. Ronald Press Co., New York, 1948. 278 pp., illus., diagrs., tables, 9¼ x 6 in., cloth, $5.00.

This book provides those engaged in industrial training work and those who wish to enter the field with a useful guide. The scope, objectives and techniques of the training now being practised by companies are set forth. Part I introduces the broad concepts which have been developed in recent years in the field of business and industrial training. Part II deals with the organization and administration of training. Part III is devoted to training programs and methods. Selected references in the major fields of the text are provided.

WAVE MECHANICS AND ITS APPLICATIONS:

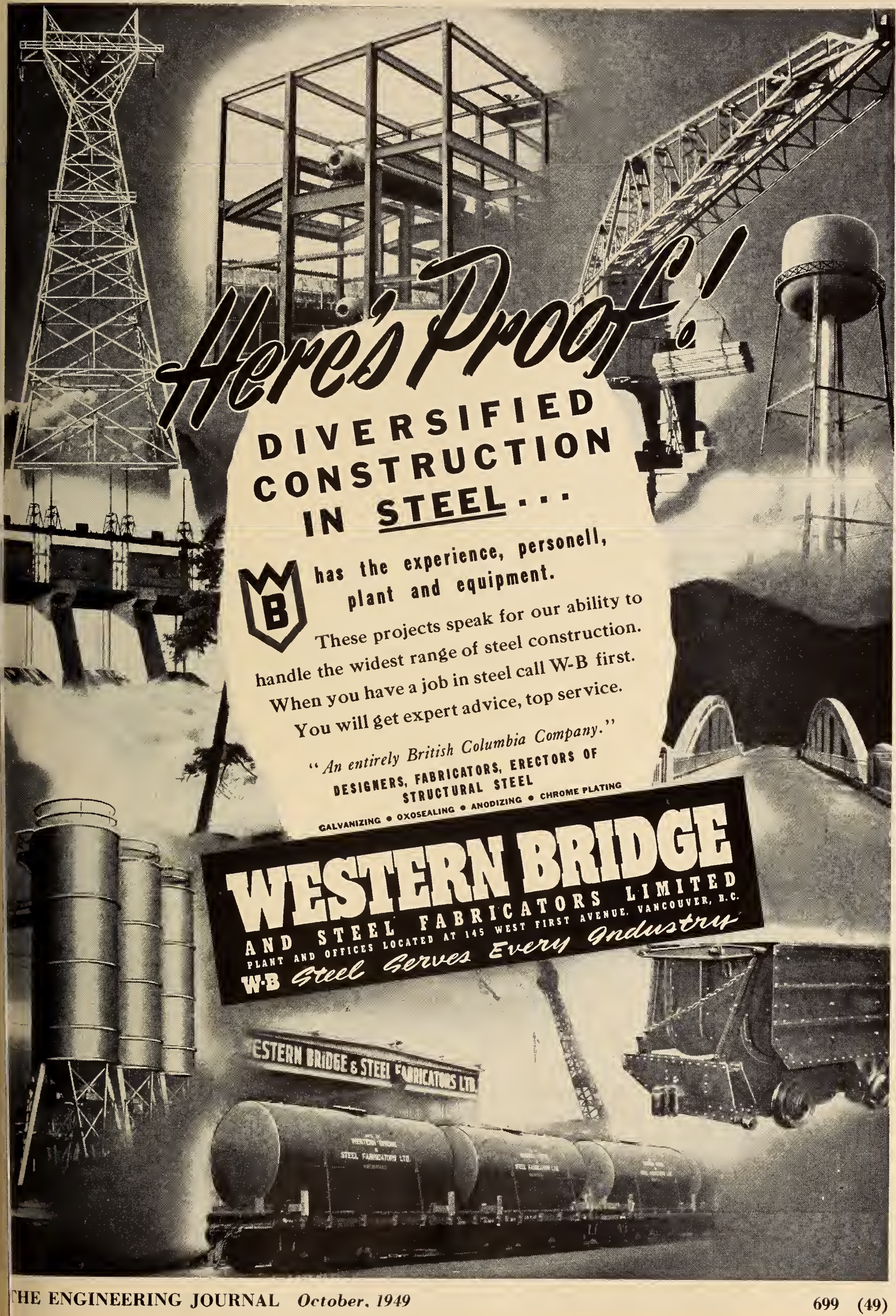
N. F. Mott and I. N. Sneddon. Oxford University Press, New York; Clarendon Press, Oxford, England, 1948. 393 pp., diagrs., charts, tables, 9¾ x 6 in., cloth, $10.00.

This book is intended for the student of physics or chemistry who wishes to use quantum mechanics. No attempt is made to present fundamentals in their most general form. Schrödinger's wave equation for a single particle in an electrostatic field and the generalized form of the equation are considered, and chapters are devoted to applications to atomic and molecular structure, radiation, and collision problems, and the properties of solids. References appear as footnotes in the text.

WELDING SYMBOLS:

V. C. Gourley. Bruce Publishing Co., Milwaukee, Wis., 1947. 115 pp., illus., diagrs., tables, 8¾ x 5½ in., cloth, $2.50.

The general standards for the use of arc, gas, and resistance-welding symbols are explained in a simple, graphic way. Illustrations consist of two parts: the drawing specifies the weld in the same manner as an actual mechanical drawing or blueprint; the explanation interprets the drawing, showing pictorially the exact location and outline of the weld. The standards and symbols demonstrated are the ones recognized by the American Welding Society. An illustrated glossary is included.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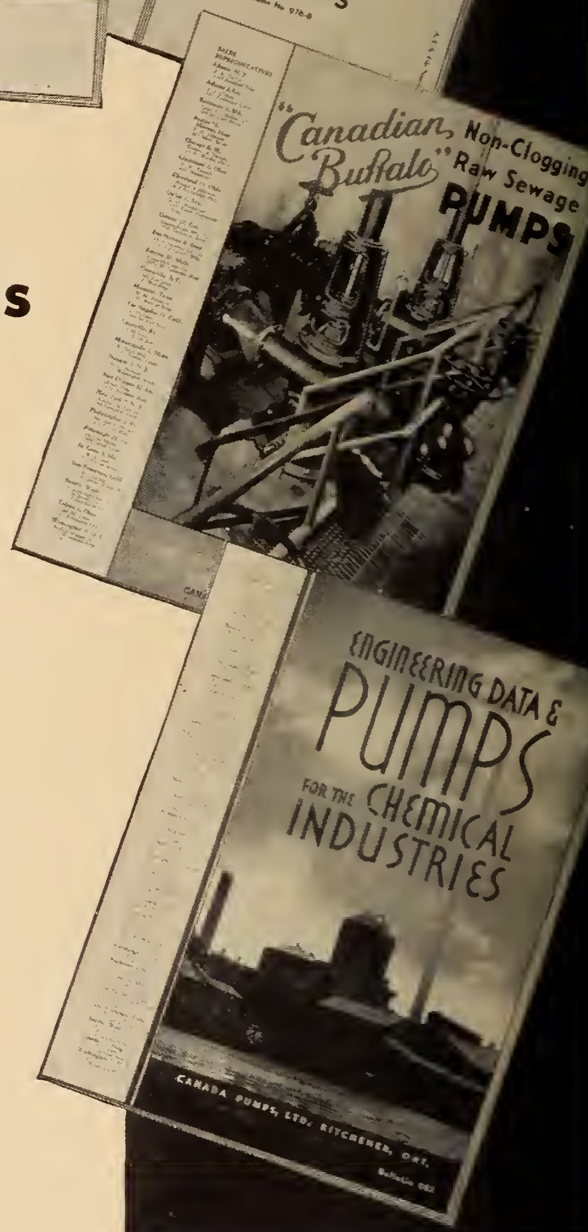

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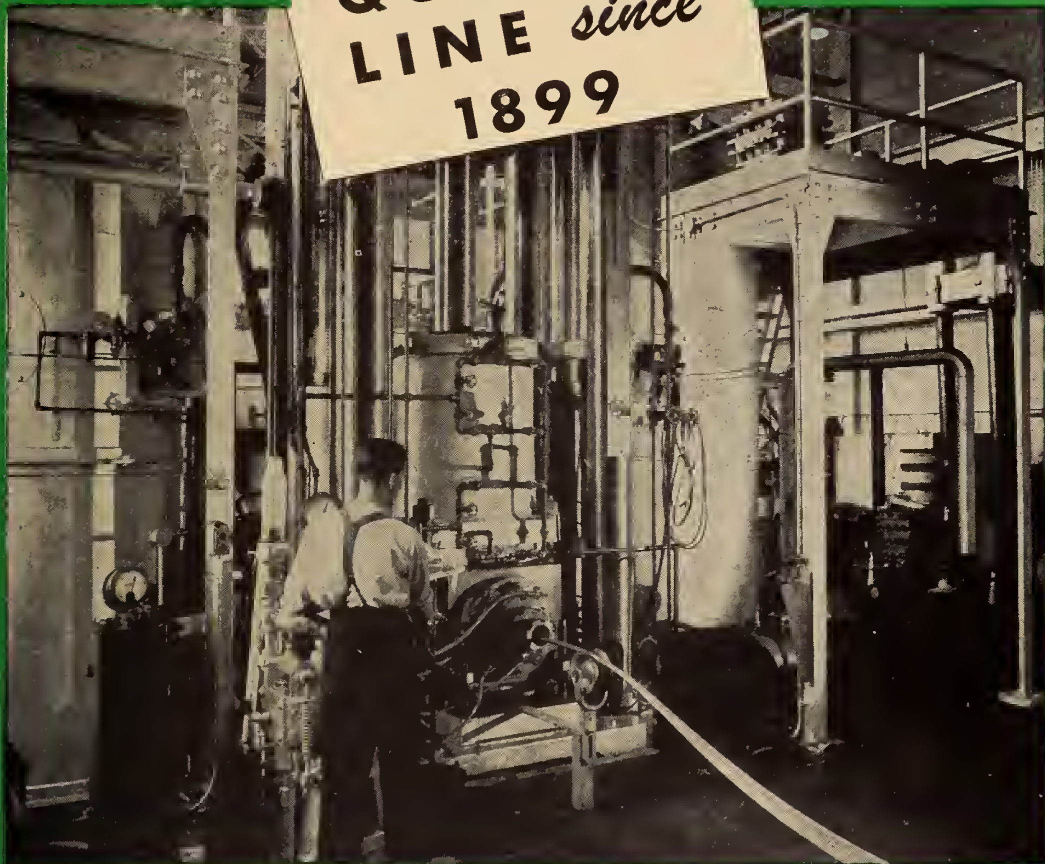

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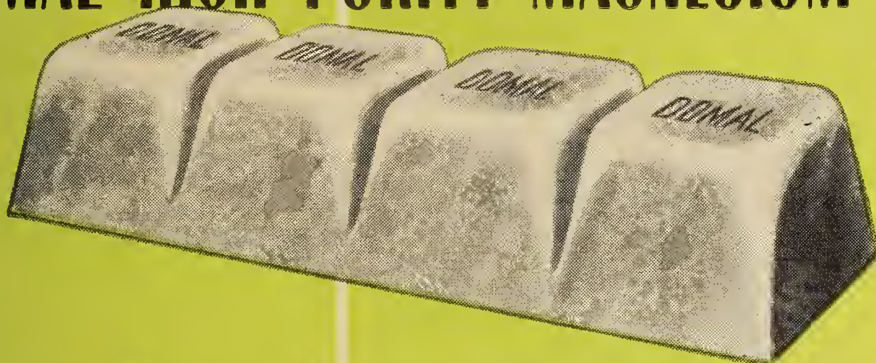

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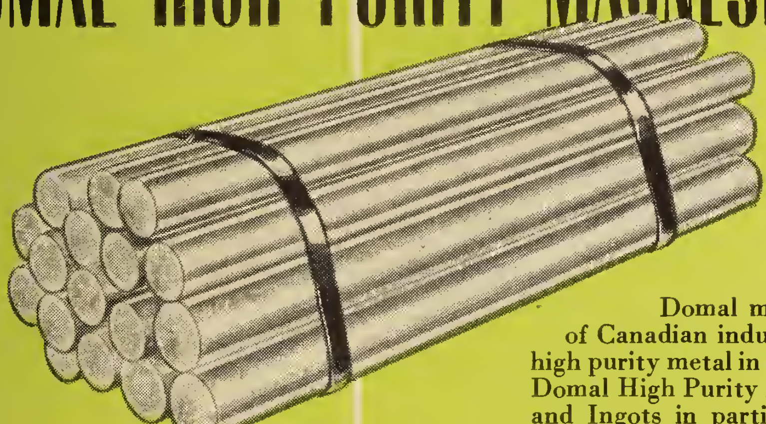

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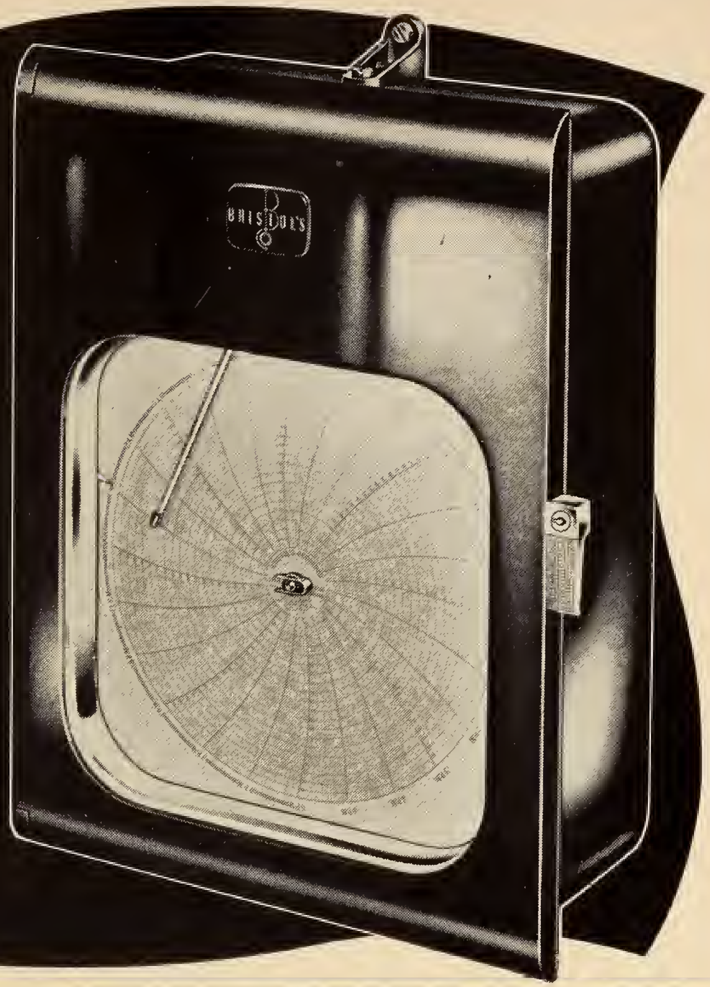

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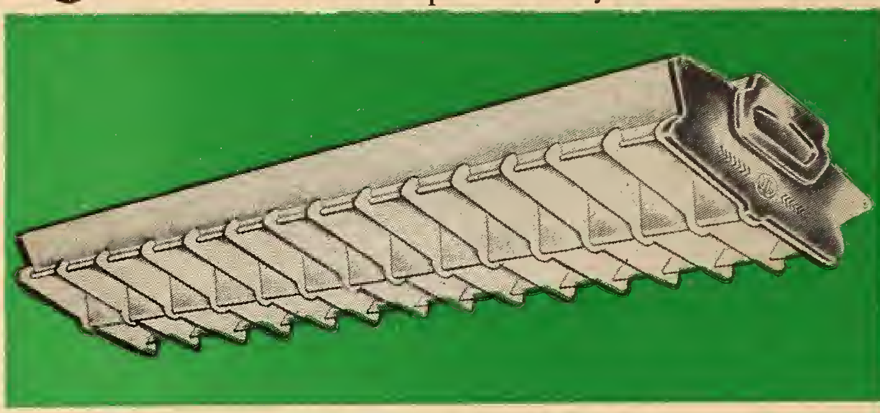

Lenox 2

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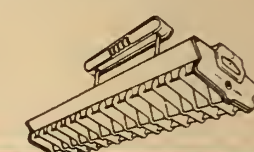

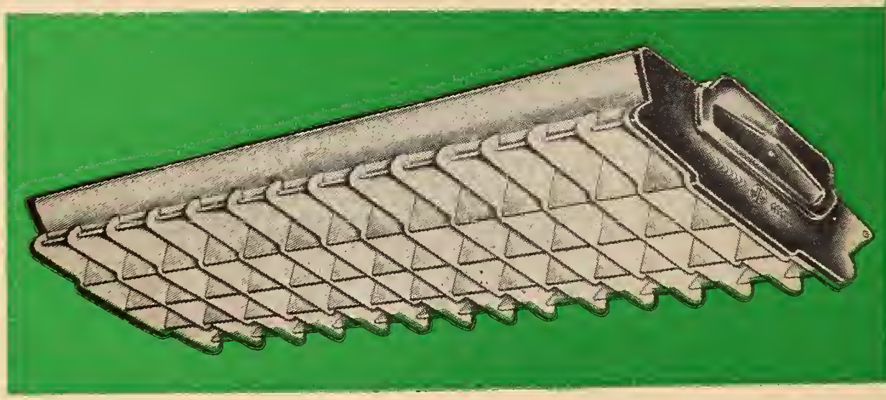

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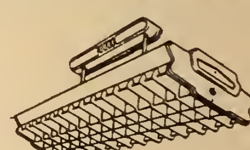

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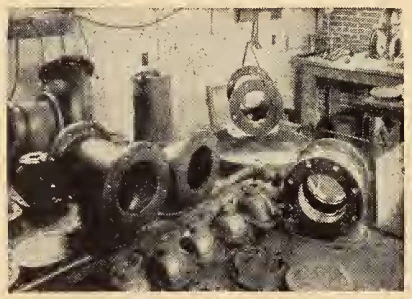

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Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

Formation of seven sub-committees to deal with research on the various phases of geology was announced by the Hon. Colin Gibson, minister of mines and resources. Named to the executive committee, to which reports of the sub-committees are made were, Dr. G. S. Hume, acting director, Mines, Forests and Scientific Services Branch, Department of Mines and Resources; Dr. George Hanson, Geological Survey of Canada, Department of Mines and Resources; Dr. J. E. Gill, McGill University; Dr. J. E. Hawley, Queen's University.

Heading the sub-committees are: metallic mineral deposits, Dr. G. M. Brownlee, University of Manitoba; non-metallic mineral deposits, industrial minerals, coal and oil, Dr. R. L. Rutherford, University of Alberta; palaeontology and stratigraphy, Dr. I. W. Jones, department of Mines, Quebec; mineralogy, chemistry and petrography, Dr. G. S. Mackenzie, University of New Brunswick; pleistocene and glacial geology, water supply, engineering geology and geomorphology, Dr. A. L. Washburn, Arctic Institute of North America; application of physical methods to geological problems, Dr. J. T. Wilson, University of Toronto; scholarship and research training committee, Dr. A. E. Cameron, Nova Scotia Technical College.

•

Flexitallic Gasket Company, Camden, N.J., has recently appointed a distributor for all the provinces east of Manitoba—Tube Engineering and Service Co Ltd., 2052 St. Catherine St. W., Montreal.

•

Claude Beaubien has been appointed manager of the Montreal sales office and G. H. Lile, manager of the Quebec sales office of the Aluminum Company of Canada Ltd.

•

T. S. MacKay is now general manager of Throwaway Bit Co. Ltd., an all Canadian Company which holds exclusive Canadian manufacturing rights to a new type of rock drill bit. The Company is a subsidiary of Boyles Brothers Drilling Co. Ltd.

•

The Department of Trade & Commerce, Ottawa, has announced the following appointments. L. Moore Cosgrave has been placed in charge of a regional office of the department in Vancouver. W. F. Rendell has been appointed to a similar post in St. John's, Nfld.

Mr. Cosgrave, until recently commercial counsellor at Shanghai, has an intimate knowledge of the Far Eastern and Australian markets. Mr. Rendell was formerly trade commissioner for the Newfoundland Government in London. With his knowledge of the British market, Mr. Rendell will be in a position to give valuable assistance to Newfoundland businessmen.

•

Quebec Iron and Titanium Corporation, Allard Lake (Quebec) Mines, Ltd., have moved their offices to 1255 Phillips Square, Montreal, Que. The telephone number is BElair 7800.

•

The Steel Co. of Canada Ltd., has made two new sales appointments. Roy L. Flegg has been named sales manager of bolt products, eastern division, and Lyle H. Doering has been named sales manager wire and screw products, eastern division. Both will make their headquarters in Montreal.

•

O. G. Moffat has been appointed manager of sales of B. F. Sturtevant Co. of Canada. Mr. Moffat joined the Canadian Westinghouse Co. in 1935 in Toronto and in November 1937 moved to Hamilton on air conditioning sales. He remained in the air conditioning sales division until October, 1944 and was appointed manager, special products section. In July, 1948 responsibility for B. F. Sturtevant Co. sales was added to the section. Mr. Moffat will report directly to the Canadian Westinghouse manager of sales, K. W. Fraser.

•

M. C. Thurling has been appointed manager of the engineering service department, Canadian General Electric Co. Ltd. He succeeds the late S. H. P. Wolferstan.

Mr. Thurling will be responsible, through the Engineering Service Department, for formulating and administering service policy of all products, and for the installation of power apparatus and electronic equipment.

New Equipment and Developments

A new slope control for use as an accessory with either synchronous or non-synchronous resistance welding machines of the single phase type has been announced by Canadian General Electric.

Designed to provide the desirable refinement of a gradual increase in welding current at the beginning of the weld, the new control materially reduced tip pick-up in spot welding aluminum, magnesium and their various alloys. The new accessory control is furnished in two types; one intended for mounting in the side of synchronous controls, the other in a separate enclosure—for use with older types of control and non-synchronous control. Complete information may be obtained from any branch of the Company.

•

The final figures for United Kingdom overseas trade during August issued on September 21, 1949, show the value of exports to be £137.1 million. This latest export return does not make a good showing against the earlier months of this year and it is the lowest since September, 1948.

Business activities of the Canadian Commercial Corporation during the year ended March 31, 1949, involving more than $200 million, were reviewed in the annual report of the Crown-operated agency, which was tabled by the Rt. Hon. C. D. Howe, minister of trade and commerce in the House of Commons on September 20.

A total of 65,308 contracts, amounting to some $145 million, were placed by the Canadian Commercial Corporation on behalf of the Department of National Defence. These contracts were for manufactured goods, construction and service, and included $16.5 million for the construction of 1,624 houses.

All the work of the Corporation involved in the negotiation and awarding of contracts on behalf of the Department of National Defence was carried out at a cost of approximately one half of one per cent of the total contract value.

•

Foreign governments and agencies used the services of the Canadian Commercial Corporation to make purchases in Canada valued at more than $35.7

million. These purchases included metals, industrial, agricultural and automotive equipment, ships, ammunition, fertilizers, chemicals, communications and electrcal equipment, foodstuffs, petroleum products, aircraft, medical stores and clothing and textiles.

•

Burndy electrical connectors which have been manufactured and sold in Canada for many years under license, are now being manufactured at the company's new plant—Burndy Canada Ltd., 381 Greenwood Ave., Toronto. The new plant, an entirely modern unit, is already in production on standard items of the Burndy line and is being tooled up to produce lines of connectors which have been of U.S. manufacture.

Burndy Canada Ltd. will operate their own sales offices in Ontario and Quebec and will be represented by manufacturers' agents in the other provinces. These sales agents, who will be announced shortly, will be closely backed by trained engineers at the Burndy Canada plant, who will be at service to the industry as connector specialists.

Burndy will continue to devote its facilities to the manufacture of electrical connectors. They offer a complete line of power connectors, connectors for both overhead and underground distribution, for industrial wiring and maintenance, and a specialized line of connectors for aircraft wiring.

•

The Steel Company of Canada, Ltd. announce that they are producing "Sems" for all classes of trade.

At hard-to-reach assembly points, "Sems', the modern pre-assembled fastener, speed the job because there is only one unit to handle." This preassembled lockwasher and screw, has eliminated hand assembly. "Sems" are available with standard washers in special sizes and types and in special materials. Screws may also be of special materials and have heads, threads and points other than those listed as standard. Full particulars and samples can be secured through any of Stelco's district sales offices.

•

On September 20th, it was announced that the Trade Department has licensed the Interprovincial Pipe Line Company to export oil and reimport it for refining in Canada. This removed the last obstacle for construction of a pipeline from Edmonton to Superior, Wis.

•

The Hon. Humphrey Mitchell, minister of labour, when addressing the youth of Canada, said, "You should not be too anxious to leave school for employment at the expense of your formal training and education."

The Minister stated that there is a definite relationship between the number of years spent in school and earnings. A study of figures taken from the 1941 census revealed that during their most productive years, workers with five to eight years schooling earned an average of 42 per cent more than those with only one to four years in school. Similarly, those who had completed nine to 12 years schooling had average earnings, 3 per cent higher than those in the 5 to 8 years group. Those who have completed 13 or more years of schooling recorded average earnings almost 50 per cent higher than those in the 9 to 12 years group.

Sir William Rootes of Great Britain has announced that arrangements have been completed with the Government of India for the Rootes Group to form a subsidiary company in India for the manufacture and distribution of its motor cars and trucks.

•

For telephone communications over long distances, the United Kingdom Post Office is using large quantities of coaxial cable. To quote a British Government release, "A coaxial cable containing two tubes can carry 600 simultaneous conversations with high quality of speech. This means a saving to Britain of 1,850 tons of lead and 1,900 tons of copper per 100 miles. In addition, the coaxial cable gives high quality reproduction of speech."

•

Since World War II, 715 new industrial projects have been approved in Scotland representing a total of $148,000,000. Of these 360 projects have been completed and 160 are in the course of construction.

•

The owner of Canadian Patent 438505 for Aircraft Safety Device and Canadian Patent 385647 for Resilient Gearing Sleeve, will supply the patented inventions or grant licenses under the patents on reasonable terms. For details apply to Ridout & Maybee, 80 King Street West, Toronto.

R. D. Werner (Canada Ltd.) has announced the acquisition of fifteen areas of land in Oshawa. It is proposed to start immediately on the building a new plant for the manufacture of aluminum products. It is anticipated that the plant will be in production early in 1950.

•

The Province of Ontario recently passed legislation by which a percentage contribution would be made to the annual cost of all municipal fire departments. The act also provides for the establishment of a central fire college and regional fire schools and appointment of travelling instructors.

•

A new compact, streamlined absorbtion type dehumidifier for both domestic and light commercial use has just been offered to the trade by the Dryomatic Corporation of America, 1600 Union Avenue, Baltimore 11, Maryland. Details may be obtained from the manufacturer.

•

British and Canadian electrical and engineering experts are meeting in Toronto during the current month to discuss problems facing the U.K. engineering industry in its drive for sales in Canada. The problems for discussion refer principally to standards. Participants representing Great Britain include members of the British Electrical and Allied Manufacturers' Association, the Cable Makers' Association, The Machine Tool Trades Association and the British Standards Institution. Canadian representatives are members of the Canadian Standards Association.

•

The reinforcing steel for Contracts S-1 and S-2 of the Toronto Transportation Commission Rapid Transit project which was recently awarded to The Steel Company of Canada, Ltd., Hamilton, will be supplied in Stelco "Hi-Bond" deformed bars throughout.

According to the Company, "this marks the first large Canadian designed post-war job in which deformed bars have been specified. It is also the first post-war job of this size to be supplied in deformed reinforcing steel by a Canadian steel mill."

Until recently, there has been no definition or specification for deformed reinforcing bars. This is still the case in Canada. However, in the United States the A.S.T.M. has produced a specification known as A.S.T.M. designation A-305, which effectively defines what a deformed bar must be. This is accomplished by stating limits for lug height, lug spacing, frequency and angle of deformations for each size of bar.

•

According to a statement released by the Dominion Bureau of Statistics on Sept. 28th, Canada's metal and mineral industries produced almost $2,000,000,000 worth of goods last year. "This represents a gain of more than $225,000,000 over 1947 and was derived through greater effort and greater turnover by every economic area in the country" the bureau states.

Production of nonferrous metals and their manufactures increased 22 per cent from $1,034,500,000 in 1947 to $1,261,200,000 in 1948. Largely through increased petroleum production the output of manufacturing establishment using non-metallic minerals as their principal materials rose 29 per cent.

The seven varieties of industries comprising the nonferrous metals group showed upward gains. The smelting and refining industry showed an increase of 27.2 per cent. Electrical products made a 16.2 per cent increase and aluminum products advanced 16.5 per cent. Brass and copper products production increased by 17.8 per cent.

All but one of the 15 types of industries in the non-metallic minerals group showed gains.

•

In a statement released to the press on September 12, Dr. Lew Kowarski, French director of scientific services said "it will be at least twenty-five years before atomic energy can compete with other fuels".

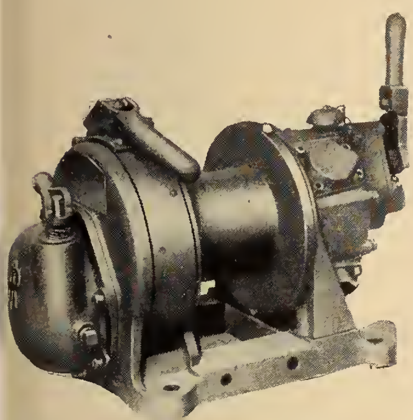
•

At a meeting held in Banff, Alta. Allan C. Ross, president of the Canadian Construction Association predicted early steps towards the building of a trans-Canada highway. He said "there appears no doubt that legislation will be introduced at the coming session of Parliament, which will provide from $150,000,000 to $200,000,000 as a federal contribution. It also appears that this contribution is likely to be predicated on the provinces and the Federal Government sharing the cost on a 50-50 basis".

Mr. Ross stated that it is certain that the routes will be determined by the provinces, each of which will have to bear in mind the necessity of joining their portions of the road with those of its neighbouring provinces.

•

Canadian Ingersoll-Rand Co. Ltd., Birks Building, Phillips Square, Montreal, Que., can now furnish a light, compact, extremely portable, single-drum air hoist for handling equipment in mines and for use by contractors, public utilities and shop maintenance crews. It is designated as Size BU and is the smallest in their present line of single-drum utility hoists.



BU Hoist

It has a rated capacity of 600 pounds :ope pull at 50 feet per minute at 80 'b. per square inch air pressure. The :ope drum accommodates 200 feet of ¼-in. or 125 feet of 5/16-in. wire rope. Size BU weighs only 72 pounds and it s the most highly portable unit in Can- ıdian Ingersoll-Rand's hoist line. Com- plete details may be obtained from the nanufacturer.

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Among the recommendations made by he United Kingdom Engineering Mis- ion to Canada was the suggestion that o supplement the work of exporting irms' representatives, the U.K. engi- ıeering industry should maintain tech- ıical representatives in Canada. It was uggested that where the cost of main- aining these "listening posts" was not ustified on purely commercial grounds, he British Government might give ractical assistance.

Sir Harry Gilpin, the leader of the nission met some 200 representatives of he U.K. engineering industries and rade associations recently to explain etails of a plan worked out by the British Treasury, the Board of Trade, he Ministry of Supply and members of he mission.

When addressing the meeting, Sir Harry quoted the Hon. C. D. Howe, who made the following statement. Canada is today the greatest importer f manufactured goods in the world. Of nachinery equipment and replacement arts alone we imported $436 million in alue from the United States in 1948 nd only $28 million in value from United Kingdom sources. Canada is a challenge to British Industry that offers a rich reward to the successful."

•

According to a report issued by the Dominion Bureau of Statistics the Leduc and Redwater oil-fields are expected to alter, radically, the entire economy of the west and "to some extent" that of Canada.

The report states, "With these fields having estimated reserves of 300,000,000 barrels in Redwater and 250,000,000 in Leduc, nothing but transportation can prevent them from making Canada self-sufficient in this regard." It is estimated that exploration costs in Alberta now are between $100,000,000 and $150,000,000 a year. "Sums larger than the total amount spent in all the years previous to the discovery of the Leduc field."

•

Durham Industries (Canada) Ltd., has purchased the business of Keating Sons Ltd. and has incorporated it into its engineering division. Products and skilled personnel remain the same. The address of the company is Island and St. Patrick Sts., Point St. Charles, Montreal 22. Telephone, FItzroy 8571.

This firm is unique in that it is the only Company located in Canada, east of Toronto, engaged in manufacturing pole-line and marine hardware on a large scale and also rendering a custom drop forging service. The firm also manufactures heavy industrial hardware and does its own galvanizing. At present the company is developing an expansion programme. The parent concern is Durham Chemicals Ltd., of England.

•

The largest known dual selenium rectifier elements measuring 7¼ x 12¾ in have been developed by the International Rectifier Corporation, 6809 South Victoria Avenue, Los Angeles 43, California. Each dual element actually consists of two of the Company's largest size 6¼ x 7¼ in. plates strapped in parallel and rated in a three phase bridge circuit at 34 amperes for continuous duty self-cooling, 85 amperes for continuous duty fan-cooling, and 340 amperes for highly intermittent duty. These dual elements are assembled in the Company's three-phase bridge heavy duty 10-kw. rectifier stack rated at 1500 amperes for such applications as magnetic inspection, etc. The stacks are designed on the basis of 16 kw. per cu ft., and are provided with an interlocked assembly to prevent lug misalignment and plate rotation. Further information may be obtained from the manufacturer.

•

A complete new line of 3½ inch long scale panel instruments of internal pivot-type construction is available from Canadian General Electric's Meter and Instrument Section. Designated as types DO-81 (direct current), DO-82 (thermocouple), and DO-83 (rectifier) the new instruments employ standard 3½ inch round, and square cases with 250-degree scales 4.92 inches long for good readability.

Designed for general industrial application, as well as for manufacturers of electronic devices, testing equipments, and similar apparatus, the instruments have permanent magnet moving coil mechanisms. With the exception of high sensitivity microammeters, they are available in all ratings now listed for conventional 3½-inch instruments with 90 degree scales. Consult the nearest C.G.E. office for further details.

•

At a meeting of the directors of the Canadian National Exhibition, held in Toronto Thursday, Sept. 8th, the Hon. Lionel Chevrier, Minister of transport, said, "Canada has more railway mileage per capita than any other nation, and makes more use of railways, per capita, than any other country. We operate over 40,000 miles of main track, and I need not tell you how complete the coverage of the ten provinces is. The use of the railways has risen steadily through each decade, from 1,200 ton miles per capita in 1900 to 4,700 today." . . . "In addition to trains, steamships, car ferries and airlines, the railway companies operate widespread telegraph systems, great chains of hotels and many other services. There are over 180,000 employees and in 1948 total wages paid by the railways of Canada amounted to approximately one-half billion dollars."

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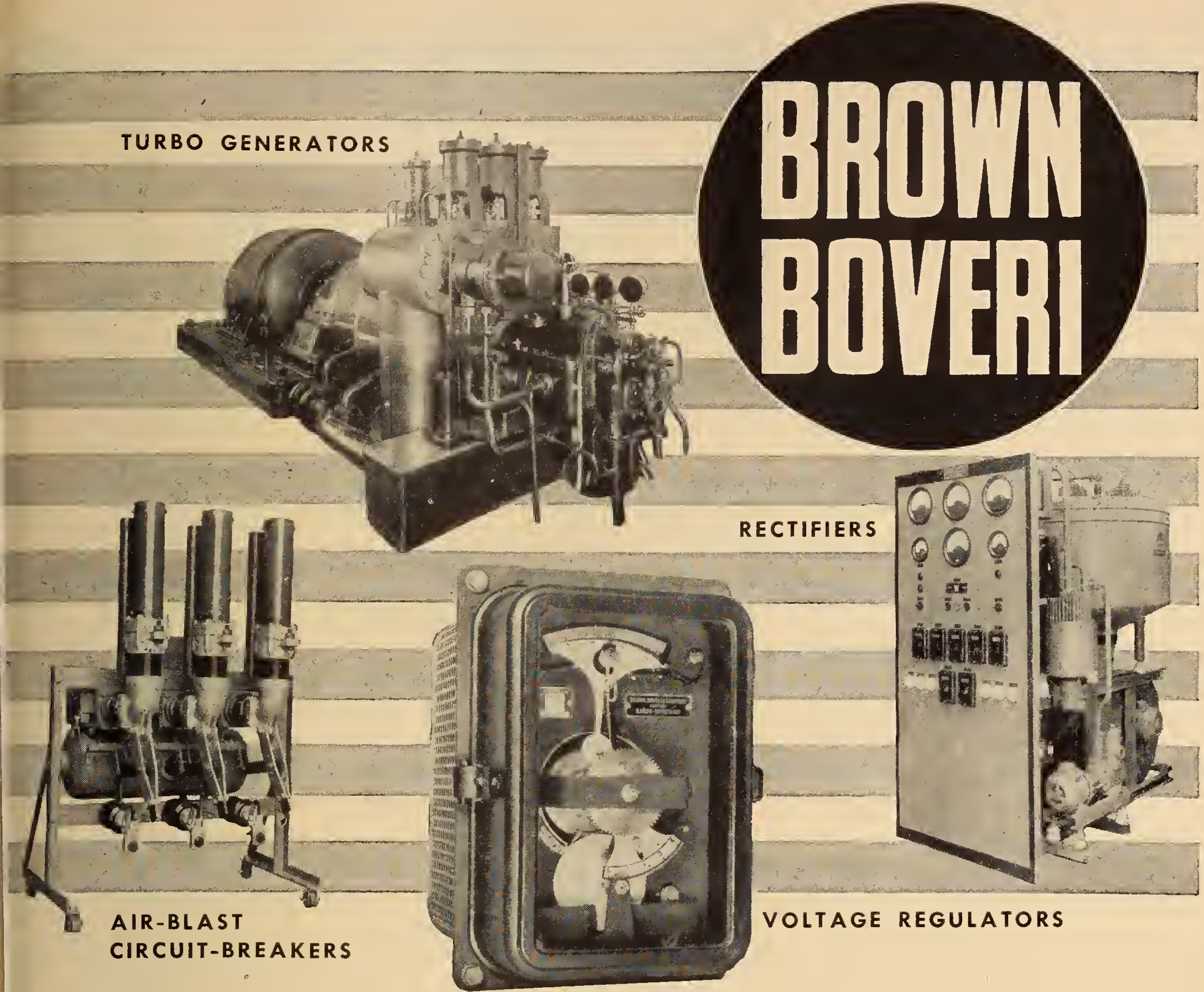
Time lost due to work stoppages arising from industrial disputes in Canada during August 1949 was the lowest recorded for any August since 1941



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On September 21, the Honourable Humphrey Mitchell announced that the Federal Cabinet had decided upon the main lines of policy to be followed in regard to paid holidays and leave, hours of work and overtime for the approximately 20,000 prevailing rate employees of the Government who do not come under the Civil Service Act. This decision has followed detailed investigation of these matters by a committee of officials.

"The Government has provided", the minister of labour stated, "a uniform plan of annual vacations with pay, and pay for statutory holidays not worked that is reasonably in accord so far as possible with the practice of the better private employers. This will involve improvements for the great majority of those directly affected. The Government has decided that it will follow the general practice of private employers in not providing sick leave to these groups of its employees, but it is proceeding now to investigate and consider the introduction or extension of group medical insurance plans for all such employees not receiving sick leave benefits. The Government has also decided that all prevailing rate employees not already covered by more favourable arrangements for overtime shall be paid for overtime work and at the rate of time and a half for all hours per week in excess of the standard work week which are also in excess of forty-eight hours per week.

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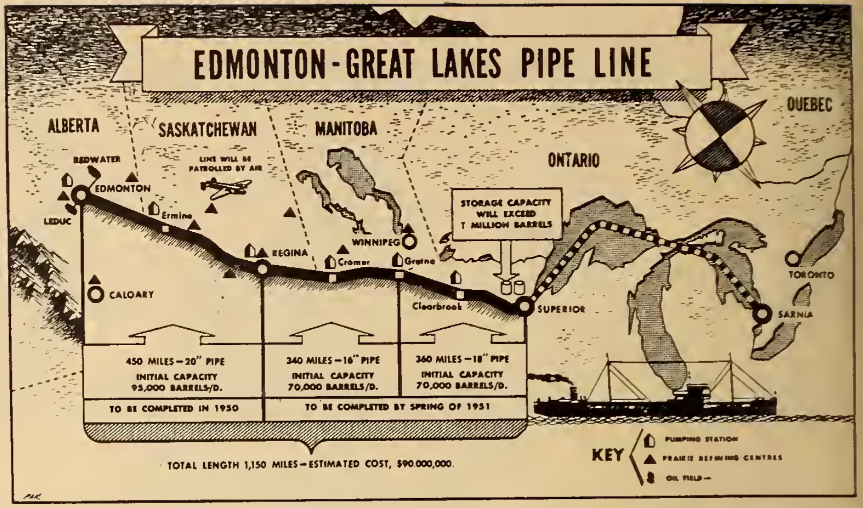

The route of the Interprovincial Pipe Line Company 1,150-mile line from Edmonton to the Great Lakes is shown above along with size, capacity, and other details. The company was sponsored by Imperial Oil. Total cost will be $90,000,000. Over the rocky, broken route to the Canadian lakehead, which is 120 miles longer, the cost would have been at least an additional $10,000,000 plus about $400,000 extra each year in carrying charges. Officials state this is prohibitive. The line to Superior takes the most direct route possible avoiding towns and other pipe line obstacles, thus providing the low-cost transportation necessary to bring western oil into eastern markets. It will aid the U.S. exchange situation by an estimated $30 millions a year by displacing foreign supplies. Merely to fill the line will take 1,838,000 barrels—64,330,000 gallons—and it will take 26 days for a barrel of oil to move from Edmonton to the terminus at Superior, Wisconsin. Here storage will be built to permit winter accumulation of oil. During the seven-month open season oil will be picked up by tanker for southwestern Ontario refineries. First oil should reach Regina in the fall of 1950 and movement to Superior is planned by early in 1951.

The British made De Havilland Comet — the world's first jet airliner — has achieved a height and speed never reached before by a passenger plane. In one of its operational tests at Hatfield, in mid-August, it reached a speed of 400 mp.h. at 36,960 feet, with weights strapped to the seats to simulate a full complement of passengers.

•

British steel production in August reached a new record for the month with an annual rate of 14,153,000 tons. The previous best rate for August which was reached last year was 14,117,000 tons. Notwithstanding the record level of production reached in 1948, every month of 1949 has so far exceeded the output of the corresponding month of last year.

•

The first shipment of British Fordson Major tractors valued at more than half a million dollars has been shipped from the United Kingdom to Canada. This was announced on September 20 by Lord Airedale, chairman of the Ford Motor Company.

•

On September 27th, the Hon. Paul Martin, minister of national health and welfare, stated that investigation and control of health hazards in industry will be aided by the purchase of more than $47,000 worth of new scientific equipment for Ontario's division of industrial hygiene. The costs will be met from Ontario's share in the more than $5,000,000 being provided annually by the Federal Government for the development of public health services throughout Canada.

Several unusual features have been incorporated in a new induction heating unit which is being manufactured by Lindberg Engineering Company, 2444 West Hubbard Street, Chicago 12, Illinois. This new unit, known as type LI-25 has a conservatively rated output of 25 killowatts at 100 per cent duty cycle with a normal frequency of 450,000 cycles per second. Units are available for operation on 230-, 460- and 550-volt, 3-phase, 60-cycle power. A manually operated tap switch allows the operator to compensate for line voltage changes.

For complete details communicate with the High Frequency Heating Division of the Company.

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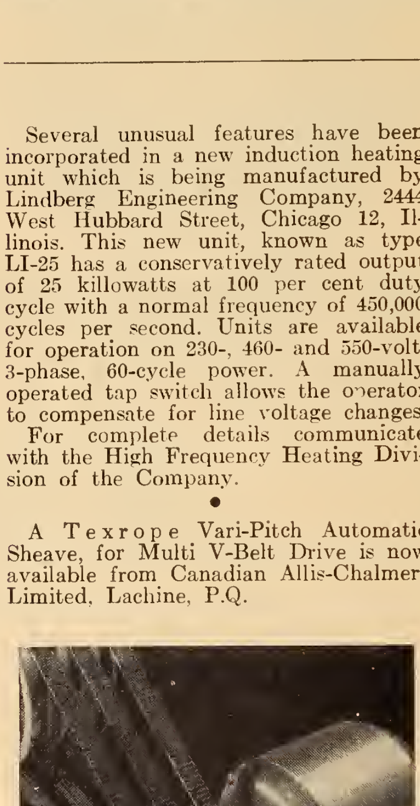
A Texrope Vari-Pitch Automatic Sheave, for Multi V-Belt Drive is now available from Canadian Allis-Chalmers Limited, Lachine, P.Q.



Vari-Pitch Sheave

This new sheave has many favourable features and covers most speed changing needs up to 2 to 1 ratios from 1½ to 40 h.p. The sheave is very simple with complete mechanism built within. There is no need to stop the machine or remove the load when changing speed ratio and belt tension is automatically maintained. Ask any Canadian Allis-Chalmers sales office for additional information.

•

Approximately 110,434,369 kilowatt hours of power was generated and purchased during the first seven months of 1949 by the Saskatchewan Power Corporation. This represented an increase of 11.3 per cent generated and purchased during the corresponding period last year. Construction projects completed during 1949 extended service to 21 villages and hamlets.

The Corporation recently awarded a tender to L. H. Achen to build 31 miles of 33,000 volt line from Yorkton to Canora at an estimated cost of $93,020.

•

A new system of screw-thread measuring has just been announced by W. T Simmons, Box 364, Amarillo, Texas. "Used with standard micrometers, the only tool now needed to measure all sizes and pitches of 60 degree threads consists of one connected pair of hardened and precision ground triangular steel bars with points truncated to clear the thread roots." It is claimed also that use of this instrument eliminates the necessity of using a formula for computing the proper dimensions to "mike" over the screw and triangles.

(*Continued on page 724*)

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CONTENTS

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COVER PICTURE

Our front cover subject this month is the harbour of St. John's, capital city of Newfoundland. For over four centuries this magnificent harbour has been used by vessels plying the North Atlantic. During both world wars it was one of the most important naval bases on the Atlantic.

Newfoundland is an important industrial and food producing centre. Wood pulp and paper, iron ore and fish are among the products for which the tenth province is known throughout the world.

On September 17, 1949, President John E. Armstrong presented a charter to the newly formed Newfoundland Branch of the Institute — thus making the most easterly link in the chain of branches extending from the Atlantic to the Pacific coasts.

—*Photo courtesy C.N.R.*

DUST PRECIPITATORS

Types, Applications and Limitations

by

John T. Doyle

Vice-President, The Thermix Corporation
Greenwich, Conn.

A paper presented before the Montreal Branch of The Engineering Institute of Canada on December 9, 1948

This paper describes in turn the various types of dust collecting equipment in use; centrifugal, impingement, electrostatic and ultrasonic showing the values and shortcomings in each, and how mechanical and electrostatic principles are combined in the Thermix Duplex Collector. Erosion of fans and other rotating elements is discussed.

Dust precipitators, types, applications and limitations cover a broad field in each of the several categories. It will perhaps be better to discuss this subject in general rather than to take each subject individually, in view of the space available in *The Engineering Journal*.

There is available to the power industry a large number of different types and designs of dust precipitators. Some are more efficient than others, but all offer a means of removing some portion of the fly ash produced by our modern steam generating units. To understand the limitations of the equipment available, we must discuss each type individually and abstractly without reference to any one manufacturer and equipment manufactured by him. It is the intention of this presentation to be quite frank and to the point. If it appears that one or more types of dust collecting equipment receives a greater amount of space than some others, it is because the facts will substantiate the space devoted to that equipment in this discussion.

In discussing dust precipitating equipment available to the power industry, serious consideration must be given to the present dust control acts and ordinances, proposed revisions to these acts and ordinances, and new laws about to be proposed or passed. In a discussion of this type, there is danger of creating in the minds of the listener or the reader, a feeling that certain equipment referred to will more than satisfy his needs, and will overcome local objections to a dust nuisance that is perhaps created by his plant, eliminating all thought as to the future.

There is agitation throughout Canada and the United States for broader and more stringent dust and fume control acts and ordinances. We should all be wary of accepting equipment that will satisfy only today's needs. We must, therefore, consider in our plant design and thinking, equipment that will serve our needs today, and equipment that can be adapted, by additions to the original installation, to serve our needs tomorrow.

Types of Equipment

Generally speaking, there are four types of dust collecting equipment offered to the industry — (1) centrifugal separation, this in several forms; (2) impingement separation, again a number of different designs; (3) electrostatic precipitation; and (4) a very recent development, sonic separation. It is the intent of this presentation to cover each of these fields and various combinations of the types mentioned.

Perhaps the earliest and best known dust precipitating device is the large diameter cyclone, in many cases ten to twelve feet in diameter. Figure No. 1 illustrates a typical unit of this general design. It is well known that this type of collector depends upon centrifugal force created by passing a fixed volume of gas through the unit at a fixed resistance and temperature. In the early days when the fly ash produced by steam generating units was of a heavy coarse nature, this device served a definite purpose, and resulted in a reasonably high degree of collection efficiency with dust particles larger than 43 microns or 325 mesh screen in size. The weakness in this design was that as the load was reduced a marked decrease in efficiency resulted.

It is an accepted fact that the cyclone depends upon centrifugal force, and this is directly related to the formula, $\frac{MV^2}{r}$. The larger the cyclone, the more rapidly the efficiency drops as load is reduced, due to loss of centrifugal force. The drop in efficiency at reduced loads occurs very rapidly, so that at one-half load little or no material is being collected. This is quite apparent if you consider for a moment a unit ten feet in diameter designed to operate at a resistance of 2 in. wg. Under full load condition, since the resistance of the cyclone separator follows the square root law, it will have a resistance at half load of only ½ in. wg. If we then apply the centrifugal force formula, $\frac{MV^2}{r}$, little, if any, work will be performed by the cyclone separator. While it is true that dust emission is reduced as the load decreases, it is also true that the dust emitted is finer and, therefore, requires a greater force acting upon it to precipitate that material.

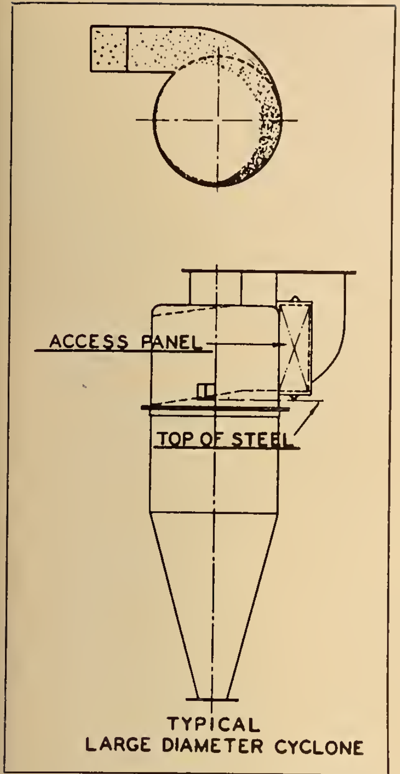


Fig. 1

The large diameter cyclone separator discussed here was followed by the centrifugal skimmer type dust separating apparatus. There are two general types of centrifugal dust collecting induced draught fans available to the industry. One depends upon precipitating a high percentage of the fly ash ahead of the induced draught fan. The other allows the fly ash to pass through the fan rotor, and to be concentrated on an elongated scroll. In each type you combine induced draught and dust collecting equipment in one single unit. Figure No. 2 shows the unit which concentrates the dust on the fan scroll.

Centrifugal Separation

The first type described above consists of so-called standard induced draught fan and is provided with special spiral inlet boxes having reversing vanes, and a so-called 'shave-off' or skimmer device. Using centrifugal force and natural momentum of the dust in the flue, the dust is concentrated at the outside of the inlet box scroll. It is then drawn off through the shave-off or skimmer, together with a small portion of the gas, and passed to an auxiliary cyclone separator, where the heavy concentration of fly ash is removed from the small volume of gas. The gas carried over to the auxiliary separator is then returned by means of a secondary fan to the inlet of the main induced draught fan. The main volume of gas, after being cleaned, passes through the fan wheel to the stack.

The second type of centrifugal skimmer dust collector referred to and illustrated below passes the entire quantity of flue gas through the induced draught fan rotor on to an elongated scroll, generally a full 360 deg. Here the added momentum imparted to the dust particles, plus greater centrifugal force created by high scroll velocities, concentrates a high percentage of dust ahead of the skimming device. In this device, as in the first type described, the heavy dust concentration in a small volume of gas is passed to an auxiliary cyclone, where the dust is precipitated, the main volume of gas being passed through to the stack. The small volume of gas passed to the cyclone, after the dust has been precipitated, is returned to the inlet of the induced draught fan. Here it is again joined with the full volume of gas, and once again passes through the same cycle to precipitate additional dust. Note that a secondary fan is not required with this type of collector.

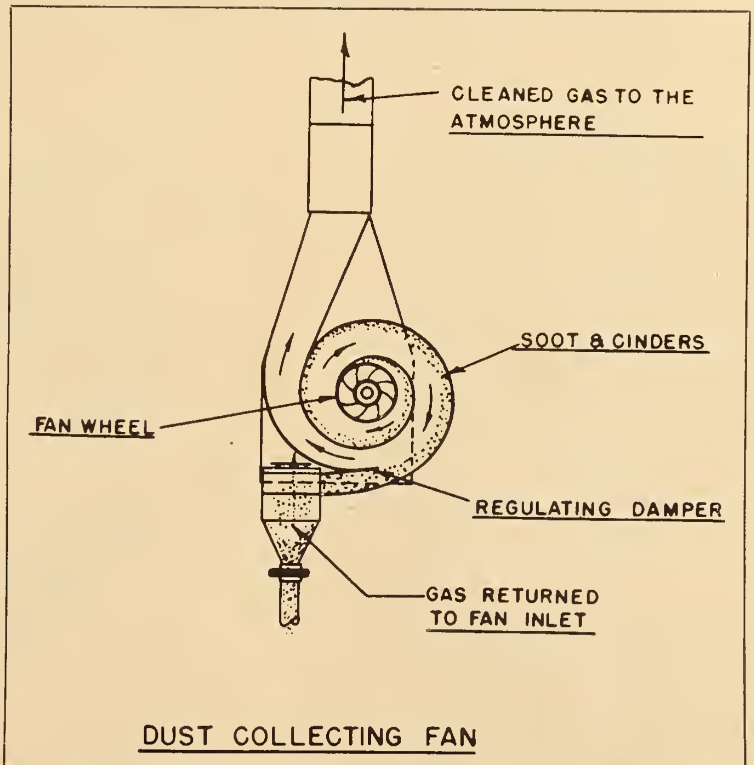
In each type of dust precipitating unit described, the overall efficiency is determined by multiplying the concentrating efficiency of the concentrating section by the precipitating efficiency of the auxiliary cyclone precipitator. The second device has an advantage over the first, in that it does not require the use of a secondary fan to return the gas from the auxiliary precipitator, thereby eliminating one additional piece of apparatus to maintain, plus the added power consumed by that secondary fan.

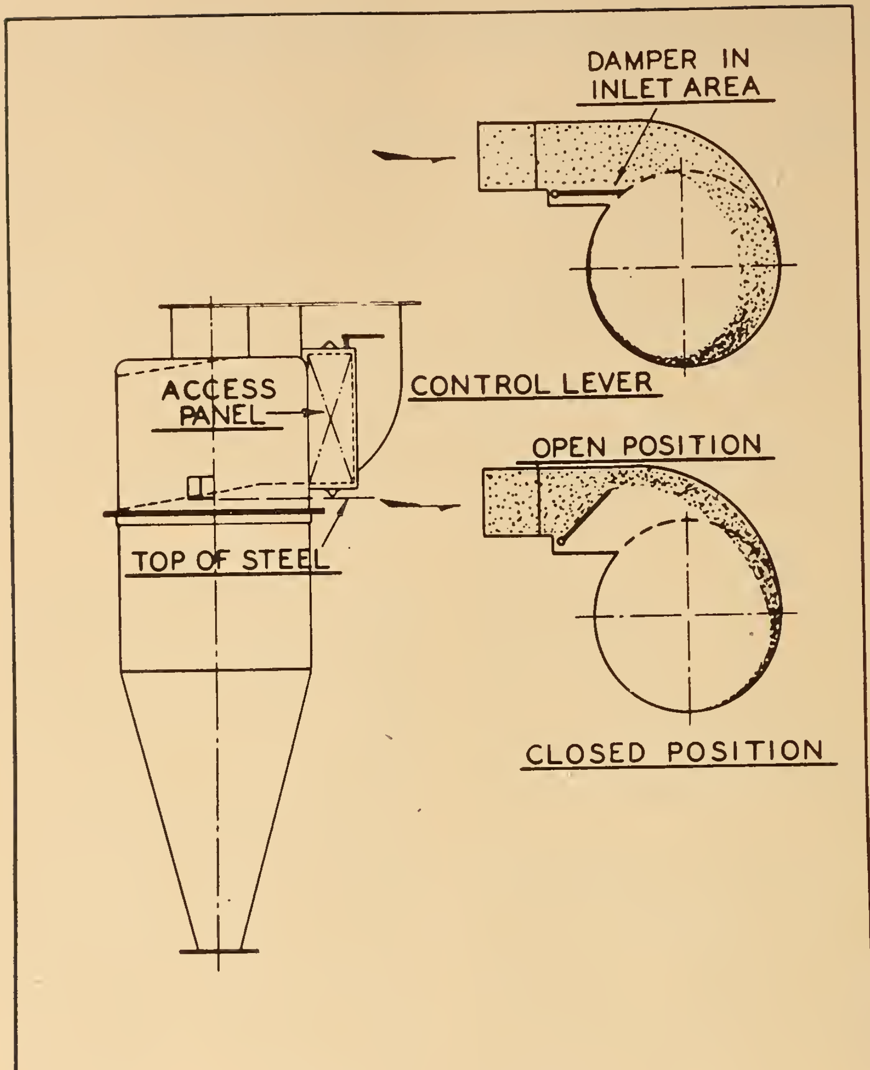
Both units remove a reasonable percentage of the fly ash emanating from the older type of solid fuel burning equipment, but do not answer today's requirements for the ultra-fine dust in the range from 0 to 20 microns. In each unit an appreciable amount of fan maintenance is required and as a general rule greater fan power is necessary than would be required if a separate dust precipitator and a more efficient induced draught fan were utilized.

It is not recommended that this type of equipment be considered in connection with pulverized fuel fired units, because the efficiency obtainable cannot meet present day dust control ordinances, and certainly will not even approach the requirements of the proposed acts and ordinances.

Continuing the research further it was found that if the diameter of the cyclone collector was materially reduced, it not only increased the efficiency at design point, but resulted also in a flatter efficiency curve over a wider range of operation. Cyclone diameters were reduced from the previously mentioned ten to twelve feet, down to approximately two or three feet in

Fig. 2





TYPICAL CYCLONE WITH IMPROVED INLET ARM

Fig. 3

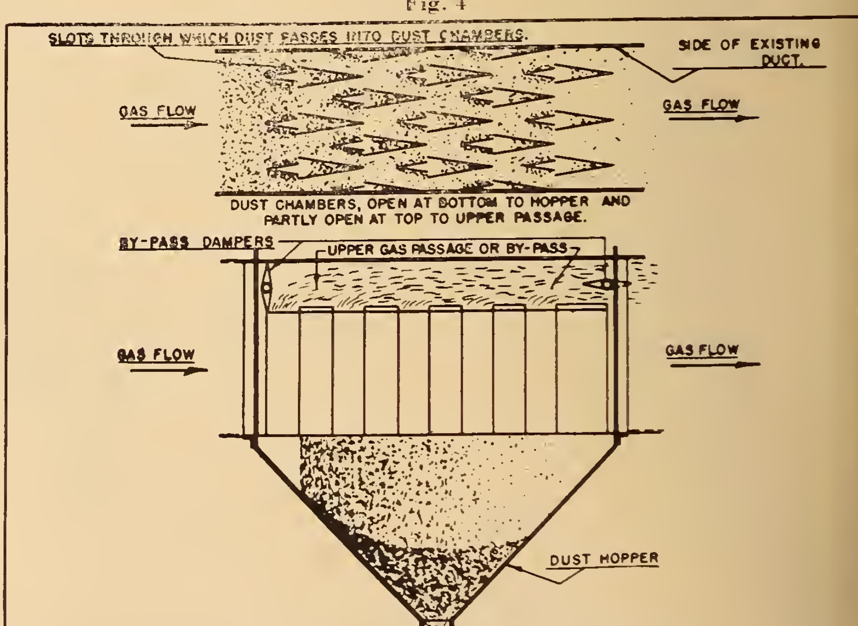
diameter. At that time they became generally known as multicyclone installations. If we again apply the centrifugal force formula, $\frac{MV^2}{r}$, to a cyclone two feet in diameter using the same conditions as previously mentioned for the ten foot diameter unit, it will be appreciated that even though the unit operates at the same design resistance, more work will be performed at that and each load point by this smaller unit. Accordingly we reach a higher degree of collection efficiency and a flatter efficiency curve over a wider load range.

Continued research in connection with the cyclone type of installation indicated that certain revisions in the design would further increase the efficiency at low load. These improvements were in the form of controlled dampers that could be operated either manually or automatically. If automatic control were used, all dampers would float on the line in parallel. As the load was reduced the damper position would change automatically. Automatic operation was preferred over manual operation, although it was more costly. It eliminated the necessary plant attendance during periods of load swing, and with manual operation the units were on many occasions ignored.

The control dampers were installed in the inlet arms of the cyclone in such a position that as they were closed, the width of the entering gas stream was reduced and its velocity increased. This caused the dust to concentrate on the wall of the cyclone at the same relative point as it would have under full load conditions. At certain points in the load range curve, the cyclone was actually more efficient under dampered conditions than at design point. The location of the control dampers in the cyclone arm of the improved design is illustrated in Figure No. 3.

Other improvements in cyclone design were accomplished by changes in proportion and in the design of the conical section and inlet arms. Still another improvement in basic cyclone design was made with the advent of the shave-off principle at the top of the cyclone proper, approximately 360 deg. from the inlet arm. This shave-off is intended to pick up from the gas stream a high percentage of the floating fines and by means of a second chamber around the cyclone proper to mix these fines at a point in the conical

Fig. 4



PLAN AND ELEVATION OF VENTURI DUST TRAP

section with the heavy concentration of dust being carried to the main storage hopper.

The multi-cyclone installations were the most efficient mechanical means of precipitating fly ash yet developed, but again there were many inherent problems that plagued not only design engineers and manufacturers but also the operating personnel of the power plants. Perhaps the greatest problems faced by all were those of space and weight. The multi-cyclone type of installation required, as a rule, a considerable amount of both horizontal and vertical plant space, which in all periods of construction has been extremely expensive when compared to the return from dust collection equipment. When interior space was at a premium, the equipment was installed on the roof or at the ground level outside the plant. Immediately another problem developed, that of properly protecting the unit from the elements, again another costly item.

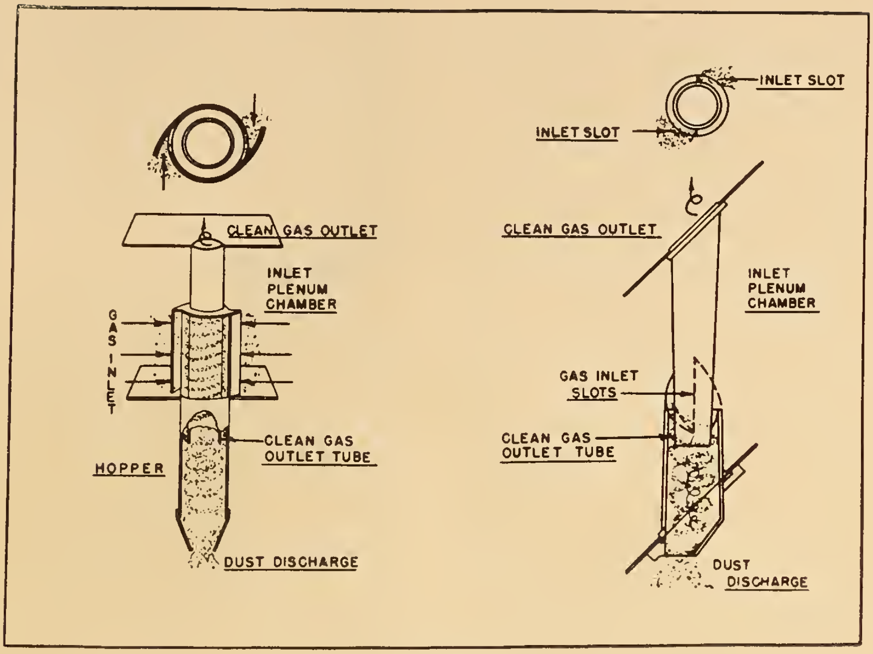


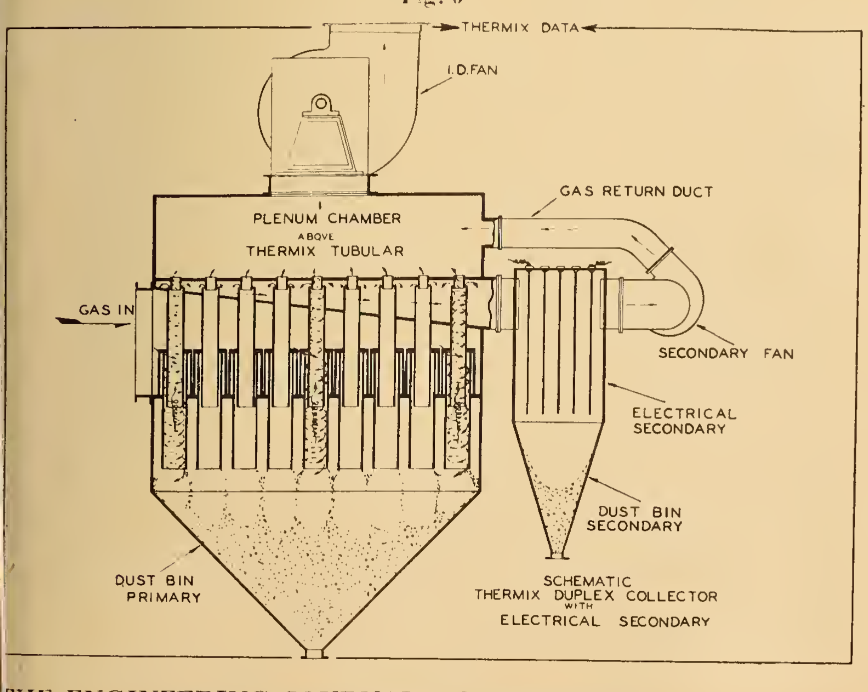
Fig. 5

Still another problem was that of cone and inlet arm erosion. At the very best some maintenance had to be expected, due to the heavy concentrations of dust and the restricted passages through which this abrasive material was forced to pass. If we add to the above the necessary draught loss to operate the equipment, we can appreciate why engineers and operators often decried the use of dust collecting equipment and in many cases eliminated it entirely from their designs, only to regret it at a later date.

The multi-cyclone precipitator compares favourably with modern day mechanical dust precipitating equipment from an efficiency standpoint. Without question it would be recommended for modern pulverized fuel fired steam generators, if it were not for its other weakness and inherent problems. The several types of dust precipitating equipment discussed above all required a fairly high draught loss. Accordingly they called for the use of induced draught fans to overcome the resistance developed. At the time of these particular developments, dust ordinances were little known and the plant operators objected to the use of induced draught fans because of the maintenance cost and power consumed by those fans. In many cases power plants were able to operate by natural draught if the dust collectors were eliminated.

To satisfy objection from plant operators the dust precipitation industry undertook research to develop a mechanical dust separator that could operate at an extremely low pressure drop, usually about .2 of an inch wg. and at the same time a unit with reasonable good possibilities of removing some dust. Such a unit could operate with a natural draught system.

Fig. 6



Impingement Type Separation

These developments, as a rule, all pointed in the same general direction towards the impingement type dust separator, a unit that depended upon change of direction to remove the dust from the gas stream. The individual designs are of little interest, but we might mention in passing that spirals, tear drops, baffles and water film covered plates were and are today still offered to the industry by many manufacturers. Under certain conditions these units will serve a very definite need in the power generating industry. The principle of the low draught unit should be considered seriously since it effects the overall results.

The impingement type collector sets up a series of interruptions to the gas flow, so that no portion of the gas may pass through the unit without striking one of these obstructions. Figure No. 4 illustrates clearly the principle of one such unit. The theory behind this low draught loss design is that the dust tends to move in a straight line, while the gas will turn and find its own passage through the unit.

In many designs, gravity alone was the sole means used to drop the dust from the gas steam into the storage hoppers. In other designs a small volume of gas was drawn downward into the hopper, then returned through a hopper vent to the main gas stream. Still another design, shown in Figure No. 4, used a diamond shaped element, which trapped the dust together with a small percentage of the total volume of gas within the element. Gravity carried the dust into storage hoppers, and the trapped gas was vented through the top of the element and returned to the gas stream. The unit depending upon the hopper vent to return the downward flow of gas to the main flue gave a reasonably good account of itself in precipitating dust to the hopper. Its weakness however was holding the total amount of dust precipitated. Due to the natural flow of gas in the hopper because of the vent design, a certain amount of precipitated ash still in suspension was carried back and polluted the gas already cleaned resulting in lower overall efficiency.

Separators of the type just described can be improved by modification of the hopper and the hopper vent. These modifications consist of installing a highly efficient mechanical precipitating device in the vent area to collect the dust escaping through the vent. The increase in overall efficiency may vary from three to ten per cent or more, depending upon the size of the material escaping. In many cases a settling chamber of reasonable proportions would give much the same result as a separator of the low draught loss type.

We have available today a number of collectors depending upon the same principle. We believe it has been proven conclusively by research throughout the years that, if efficient dust collection is to be expected, we must depend on one of several proven theories, collection by centrifugal or electrostatic force or a combination of both. In general, we may sum up our discussion of the impingement type separator by saying that this method is successful with relatively large particles; that is, particles 74 microns in diameter, or particles remaining on a 200 mesh screen. With certain types of stoker installations the impingement type separator is capable of eliminating a dust nuisance within the confines of the plant area, but there is still a considerable percentage of relatively fine dust escaping the unit that will fall only a slight distance beyond the plant. It is safe to say that this type of separator will not meet present day smoke and fume control acts and ordinances.

Electrostatic Separation

As the public in general began to realize the extent of dust pollution in the air, they agitated for and received from local governments dust ordinances limiting stack emission. It became apparent to most engineers that if we were to meet those ordinances, we must return to centrifugal and/or electrostatic precipitators. Once again, objections were raised by power generating groups against the equipment available. This time power consumption was accepted, since most large steam generating units required induced draught fans to operate even without collectors, but the space required and the extremely heavy weights of equipment had become the greater problem. Again the dust precipitation industry undertook to research and design equipment that would overcome the objections raised. Today the industry has installed in most large plants the same general type of multi-cyclone as previously described, but utilizing collecting elements in diameters from 3 in. to 9 in. rather than the larger diameter cyclone.

Several distinct advantages were gained by this new development, perhaps the most advantageous was the reduction in space requirements. In many cases these new units occupy less than thirty percent of the space required for the large diameter cyclone installations. The weight is about in the same proportion. Another outstanding result was the elimination of erosion. In general, straight wall tubes were used, and if conical sections were installed, the reduction in area between the main precipitating body and the outlet of the cone was about one-tenth of that found in the cyclone. Therefore, velocities through the critical areas were considerably less.

At the same time the dust concentration in each individual unit was lower. Again, it was proven that by reduction in precipitating element diameters a marked improvement was found in the precipitating ability of the mechanical precipitator. The overall efficiency curve became flatter. It became possible to collect a higher percentage of the ultra fine dust, until today it is possible to collect with the extremely small diameter element 100 per cent of all particles larger than 25 microns and to collect better than 95 per cent of all particles larger than 10 microns in diameter. We believe that a large contribution has been made in the dust precipitation field by this continued research.

In general the smaller diameter collector elements follow the same principles with modifications in inlet slots or vanes, diameter and length of tube. Figure No. 5 illustrates two unit elements, one using a tube with two tangential inlet wings which project beyond the tube wall. The purpose of these wings is to lead the gas to the tube, so that it enters tangentially to the vertical tube wall and to start the downward spiral. The second unit element uses two ramps and vertical slots to accomplish the same purpose. Other types of inlets are used as well as the two shown and discussed but, in general, all accomplish the same end result.

During the period in which the above developments occurred there was available to the industry the electrostatic precipitator, perhaps the most efficient collector when properly designed and applied. If space and first cost are ignored it can be designed to give just about any efficiency desired. There are very definite drawbacks to its use, the main ones being high first cost, extremely heavy weights and last but not least, high maintenance cost to maintain peak efficiencies. It is available in a number of different designs, all basically the same but with modifications in the collecting and ionizing electrodes to meet certain definite design requirements. This type is most efficient in the lower microns range, but shows a marked decrease in efficiency on the larger particles, those above 30 microns. Until recently it was most inefficient on carbon particles of all sizes.

Research on the electrostatic precipitator has continued at a fast pace, until today we have units available to the industry that overcome one of the two objections stated above; that is, the inability of the unit to hold the carbon particle once collected. Perhaps the greatest drawback to their use in our large modern steam generating plants is the amount of service and maintenance required to maintain the unit at peak efficiency. In many cases engineers have substituted a less efficient mechanical precipitator in its place, so that the steam generator might operate for greater lengths of time without the necessity of frequent outage to service auxiliary units.

In other cases elaborate by-pass ducts were provided to gain the same result. Both the power generation and dust precipitation industry realized that equipment had to be developed that would meet dust ordinances. It would also have to provide continuity of operation over extended periods of time, without outage for auxiliary equipment service, both collectors and induced draught fans. If possible, for the larger steam generating units this operating period should be at least a full eleven months. Today many engineers are discussing ways and means to extend this period to twenty-four and possibly thirty-six months.

Combination of Mechanical and Electrostatic Principles

Independent research by a dust precipitation manufacturer, and then joint research by that manufacturer with one of the larger public utilities, pointed towards a combination of both mechanical and electrostatic precipitation as a means of accomplishing both needs. It was felt that if a collector or combination of collectors could be developed that would satisfactorily produce 90 per cent precipitating efficiency when serving a pulverized fuel fired boiler, that most of the problems would be solved. It was well known that this could be accomplished and even bettered by the use of a full size mechanical and full size electrical precipitator, but its cost at that time was prohibitive.

The research mentioned above brought forth a unit known as the "Duplex Dust Collector" consisting of a mechanical precipitator followed by an electrical precipitator handling only a small percentage of the total gas flow. The unit was so designed that the mechanical portion of this combination could be included in the original plant design. Figure No. 6 illustrates such a unit in diagram form. When forced by local ordinances to improve plant conditions, a "Duplex" skimming section could be added to the unit. The electrical collector to be installed at that time would be approximately 20 per cent of the size of a normal precipitator handling the full flow. Efficiencies of 90 to 92 per cent would then be possible depending upon the overall design. Actually, the high efficiency was only one part of the overall result.

Perhaps the most interesting part of this design was the fact that the electrostatic precipitator could be removed or cut off from the system at will. At the same time peak efficiency was maintained on that unit without interrupting the continuity of service of the steam generating unit, and at the same time maintaining a reasonably high basic efficiency, in most cases with a pulverized fuel fired boiler, better than 80 per cent. The recent war restricted, to a great extent, completion of the research on this particular design. It is only within the past few months that this research was completed and brought to a successful conclusion. There are possibilities, where the efficiencies obtained with electrostatic second-

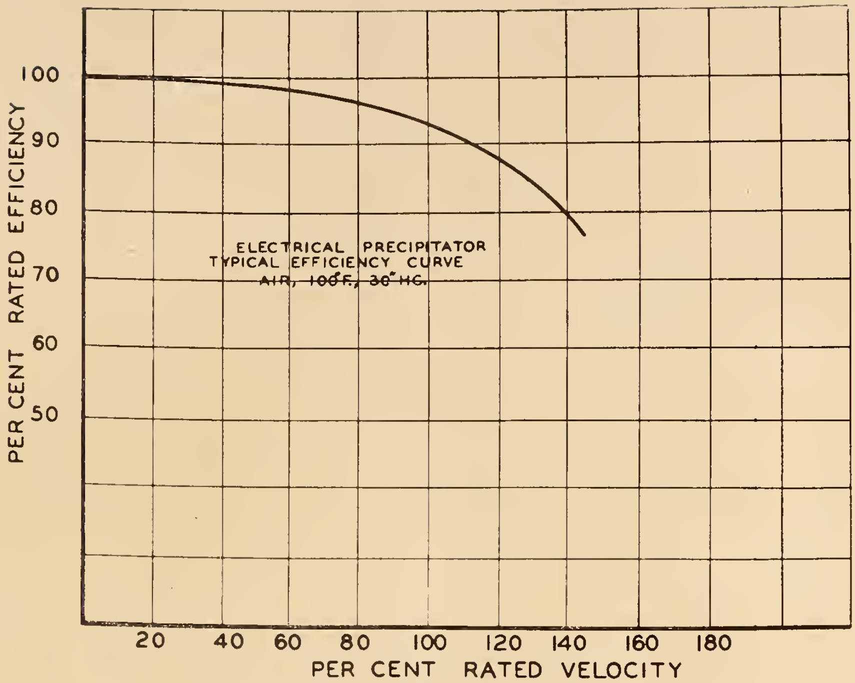


Fig. 9

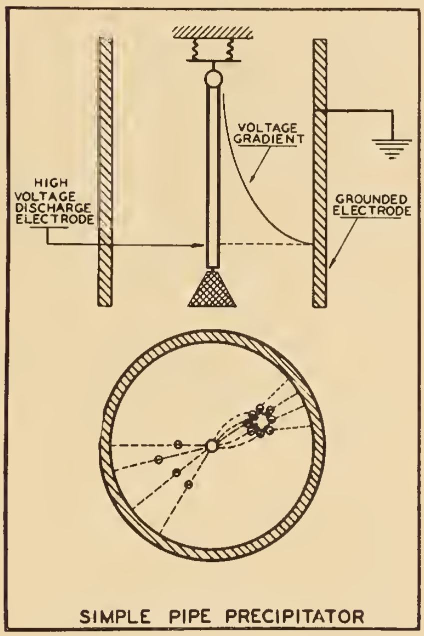
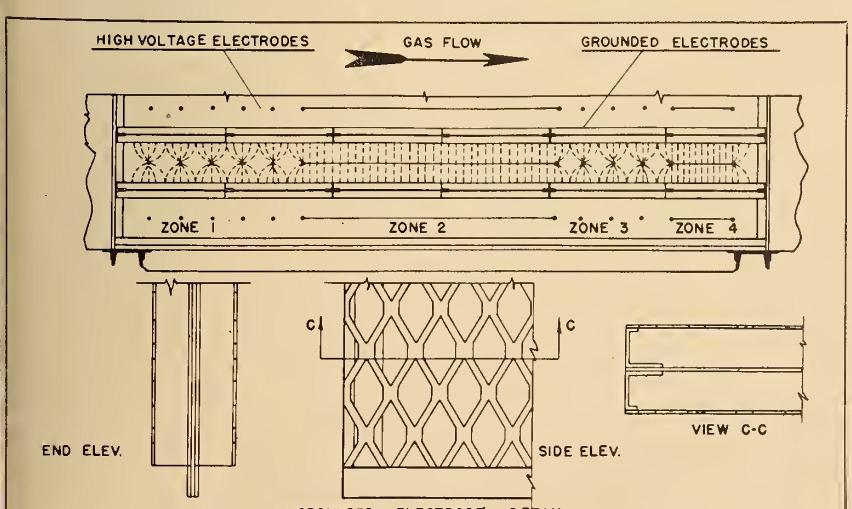


Fig. 7 (right)
Fig. 8 (below)



aries are not and will not be needed, that the cost can be reduced by the use of highly efficient mechanical precipitators in the secondary stage. If the mechanical secondary is substituted for the electrostatic, continuity of all equipment is assured. The penalty in collection efficiency will perhaps be not more than 2 to 2½ per cent, but the cost will be sharply reduced.

Dust codes have here been discussed, and the seriousness of these codes pointed out. Enough cannot be said on this subject to impress their effect upon all of the power industry. Many of us now active in this work believe that the codes are progressing faster than research in the art. This doubtless is true if we take into consideration the cost of the equipment to meet these codes. Collection efficiencies of better than 98 per cent are possible and available. To obtain these efficiencies you must use the most efficient mechanical collector available, together with the most efficient design of electrostatic precipitator. A number of series installations using equipment of the type referred to above are either in operation at the present time or in the process of fabrication. There is every reason to expect that these installations will prove to be the pinnacle of dust precipitation for pulverized fuel fired boilers. The cost is great, though considerably less than similar equipment could have been installed for five years ago, and the space factor must also be considered. Public opinion in our larger cities now, and in small communities a few years hence, will make the use of this type of equipment mandatory for all pulverized fuel fired boilers at least, and modifications for the same equipment for other types of fuel firing.

Figure No. 7 indicates a simple pipe precipitator. It may also be considered an illustration of a rod curtain type precipitator. This in general is the unit which most of us have known in the past. One inherent weakness of this design was its inability to hold large ash particles and carbon particles of most all sizes once collected. Actual field work with the rod curtain type precipitator indicated that carbon particles could be readily charged but very little collected. What little was collected was in the very tail section of the precipitator. These field tests consisted of placing a series of sectionalized trays beneath the collecting or grounded electrode, so the collected material could be sampled and the percentage of carbon in each area actually measured.

In one of today's modern units a screen protected and baffled collecting electrode is used. Its basic purpose is to overcome at least two of the weak points of the rod curtain design. Identical tests to those described above were carried out with this unit. It was found that the carbon particle, which we know is easily charged since it is a conducting particle, was collected in the very first few feet of the precipitator. The larger ash particle was also prevented from "balling up" with its neighbours and rolling along the electrode through the unit. This change in electrode design can be considered a step in the right direction in precipitator design. (Figure 8).

It is a well known fact that the electrical precipitator is most efficient at its design rating. A typical curve is shown in Figure 9. Note that the unit selected has an efficiency of approximately 92 per cent at design point, or 100 per cent of rated velocity, and that, as the load or velocity through the unit is reduced, you approach 100 per cent efficiency. As the load or velocity is increased beyond 100 per cent of rated capacity the curve begins to droop, until at a point of approximately 140 per cent of rated velocity, you drop well below your design efficiency.

Improvements in rectifying equipment have been made which will improve the overall installation and operating characteristics of the electrical precipitator. The most common type of rectifying unit is the mechanical pin wheel type. One of its basic faults is the high first cost of providing a well ventilated enclosure, first, to prevent dust buildup on the contacts and secondly, to prevent corrosion of copper buses and breakdown of many types of rubber insulation caused by high concentrations of ozone. The problem of maintenance of contacts and synchronous motors also becomes a problem of prime importance.

The more modern type of electrical precipitator utilizes a tube type electronic rectifier which may be enclosed in a small enclosure and needs no special ventilated enclosures. Many engineers have a definite prejudice against the tube type rectifier and feel that it is far from satisfactory, perhaps due to tube failure within a relatively short space of time. Protective devices now built into the rectifying unit have, however, increased the tube life to a point where we can expect operation of thirty to forty thousand hours without tube replacement. It is felt that if tube life of this span can be expected, the electronic rectifier will in time completely replace the pin wheel or mechanical rectifier.

Ultrasonic Separation

A more recent development in the art of dust collection is "Ultrasonic Precipitation", a development made possible by extensive research in sound generation during the recent war. Today, most of the ultrasonic work is in the pilot plant stage. These pilot plants point to extremely interesting possibilities in the field of dust collection, although not necessarily in the power generation field. What little is known about it indicates that an extremely efficient means of agglomerating the ultra-fine particles of 0 to 15 microns is at hand. However, again a mechanical precipitator must follow the sound generating chamber. Efficiencies of 90 per cent or better can be obtained but it will be noted that we are still talking series installation, hence high first cost.

Erosion of Rotating Elements

It is felt that here is the place to discuss briefly the cause of fan erosion, because it is related directly to dust collection efficiency. Research undertaken in the past several years in connection with coal fired gas turbine locomotive developments has proven that, if we can efficiently remove a high percentage of all dust above 10 microns in size, we can eliminate erosion on rotating elements such as fan or turbine rotors. It was pointed out above that the electrostatic precipitator was most efficient in the lower micron range, but that its efficiency showed a marked decrease in the sizes above 30 microns. This is the dust that causes fan erosion. Again we see the desirability of series installations, using the electrostatic unit for collection of the ultra fine dust, and employing the mechanical collector to remove the coarse particles to eliminate fan wear.

Summing up, we suggest that all design and operating engineers seriously consider the needs not only of today, but also those of tomorrow, and to select today equipment that can by addition be adapted to meet tomorrow's requirements.

To satisfactorily meet these needs the use of a reasonably efficient centrifugal separator should be included in present plans, and then by additions of more efficient precipitators we may meet the requirements of a few years hence.

Quebec's Undeveloped Water Powers

A paper delivered at the Sixty-third Annual General and Professional Meeting of The Engineering Institute of Canada, at Quebec, May 11-14, 1949.

by

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Defining the distribution of power resources and installed capacity by provinces, the author records the potential power resources and turbine capacities on rivers within each drainage basin of the province of Quebec, briefly describing each development and showing discharges per mile of watershed.

Maintaining that within three decades Bersimis and Manicouagan river power will have to be tapped to augment the supply for the industrial areas along the St. Lawrence, he urges bringing the 1928 Inventory of Power Resources up to date, and the speeding up of gauging and compilation of flow data on rivers draining the North Shore and James Bay areas, which constitute the next sources of supply.

At the beginning of this study it seems expedient to consider first the water power resources in the World and in Canada. However, in observing Tables I, II and III, it must be kept in mind that most of the figures or potential power express orders of magnitude rather than known amounts.

Industrial use of water power really began during the first half of the nineteenth century with the construction by Benoit Fourneyron of the first practical hydraulic turbine, and it later received a decisive impulse from the invention of the electric dynamo, motor and transformer, and from the achievement by Marcel Deprez of the first practical transmission of electrical energy. Prior to that period, the use of the water power was relatively rare.

Few countries have as yet made systematic studies of their water powers. The most reliable statistics are those of western European countries. As a result of their past military and national needs, these countries already had, at the beginning of the industrial water power era, an almost complete knowledge of their territories, together with long-term experience of hydrology and climatic characteristics. They were consequently able to compile an almost complete and accurate inventory of their hydraulic resources.

In spite of their good points, statistics for the United States and Canada are not final, for in these countries there are vast territories still almost unexplored. For Asia, Africa, South America and Central America, where great expanses of territory are practically unknown, statistics are based on incomplete data regarding the prevailing conditions of rainfall, run-off, and topography, etc. Nevertheless, they are useful, in that they give a general outline of the distribution of the world's water powers.

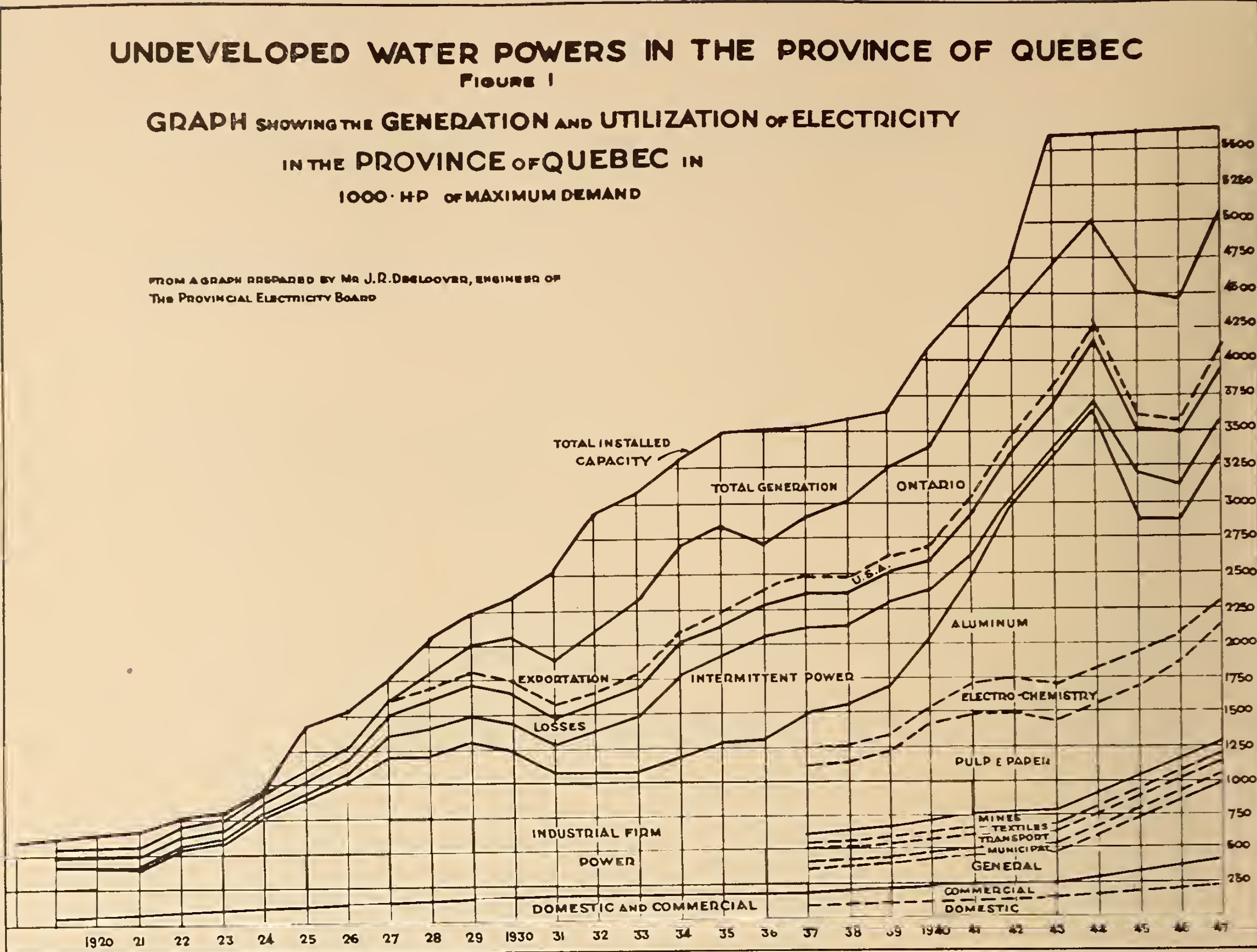
So far it has been impossible to obtain a recognized general agreement as to a uniform basis and method of evaluating hydraulic resources. Many countries still follow their own methods in recording their potential water powers. As a result it often happens that the statistics cannot be compared and used reliably. The most notable efforts and progress in this field have been those realized at the World Power Conferences (London 1925, Berlin 1930, Washington 1936). As water power development is always progressing, reliable statistical information concerning it is, in general, never strictly up-to-date.

Province of Quebec

The most accurate data at our disposal regarding the hydraulic resources of the Province of Quebec are those relative to the main streams of the central part of the province, in the St. Lawrence Valley. For the more remote parts of the Province, the given data are only the results of preliminary and rough surveys or estimates.

The total area of the province is approximately 600,000 square miles, of which about half lies between the 52nd parallel of latitude and the Hudson Strait, comprising the drainage basins of James, Hudson and Ungava Bays. This region is practically uninhabited and considered mostly unproductive, exception being made for forests found in certain parts and for mineral resources the development of which has just begun. Forests still cover an approximate area of 244,000 square miles; water an area of 91,000 square miles (not including the St. Lawrence River and Gulf); an area of 260,000 square miles is considered unproductive, and almost 20,000 square miles are cleared or cultivated. This latter area is south of the 52nd deg. of latitude, and mainly situated in the valley of the St. Lawrence.

The early and rapid development of the hydraulic resources of Quebec had resulted in a great number of



demands for water power throughout the Province when, in 1928, our first general inventory of water-powers was published to meet this constantly increasing demand for information.

Based upon the data then available, this valuable piece of work, entitled "List of Water powers in the Province of Quebec", had been prepared jointly by the three following organizations working in close co-operation: The Dominion Water-Power and Reclamation Service, the Quebec Streams Commission, and the Hydraulic Service of the Department of Lands and Forests (Quebec). Data had been secured from field studies of the Dominion Hydrometric Survey; reports and investigations of the Quebec Streams Commission; the Surveys Branch and the Forest Service of the Department of Lands and Forests; the Geological Survey of Canada, etc. Much valuable information had also been obtained from power companies utilizing water power.

At that time, stream flow records had been confined to the more accessible part of the Province. With such records available for a reasonable period, it was possible to make fairly accurate estimates of the power possibilities. For higher accuracy flow records of longer duration were needed for most rivers. In the remote parts of the Province stream flow records were meagre, and assumptions had to be made which might require revision in due time. Consequently, the list was merely intended to indicate, from the best information then available, the probable possibilities of the water powers, and to provide information which could serve as a starting point for a more detailed study of individual sites.

Although it expressed orders of magnitude rather than known amounts, the 1928 inventory has proven of great value and usefulness. It is fundamentally a catalogue of the falls and rapids then known, which might eventually be the object of practical development. For each site is given head, area of the drainage basin above the site, and estimated capacities at ordinary minimum and ordinary 6-month flow. Most of the listed falls and rapids are likely to be eventually developed.

The exact capacity of a site need be known only at the time of its development; the capacity indicated in the inventory is generally sufficiently accurate for preliminary studies. Often it is possible to combine several falls and intermediary rapids, and thus to realize a greater head. The 1928 inventory, however, reports separately each falls and rapids. The estimated capacities are calculated for conditions of natural flow, without consideration of storage and regulation possibilities, except in cases of rivers already regulated or proposed for regulation at the time of the inventory.

Since its publication, federal and provincial departments concerned have added to their files all new data they can gather regarding potential water powers, from topographical maps and profiles of rivers made by the Quebec Streams Commission; from the river gaugings and the daily observations obtained by the Quebec Streams Commission and the Dominion Water and Power Bureau; from the Survey Branch of the Department of Lands and Forests (Quebec); from maps of forestry companies, and from the plans and studies by private companies or engineers for specific needs or projects.

TABLE I

WATER POWER OF THE WORLD

Inventory by Continents of Potential and Developed Water Power as of January 1942

Continent	Water-power million horsepower		Per cent	
	Developed	Potential	Developed	Potential
North America	29.61	77	41.3	11
South America	1.67	75	2.3	11
Europe	30.14	74	42.1	11
Asia	8.67	151	12.2	23
Africa	0.21	274	0.3	41
Oceania	1.33	21	1.8	3
Total	71.63	672	100.0	100

Extract from H. K. Barrows' *Water Power Engineering* by Courtesy of McGraw-Hill Book Co.

TABLE II

WATER POWER OF THE WORLD

Developed and Potential Water Power Resources of Countries Having Developed Resources of 500,000 or more Horsepower

(Extract from the Canada Year Book 1940)

	1938 Developed Power		Potential Power
	Capacity of Installed Machinery at Constructed Plants	Per Capita Installation	Based on Ordinary Minimum Flow at 100 p.c. Efficiency
	h.p.	h.p.	h.p.
United States	17,948,906	0.140	33,500,000
Canada	8,190,772	0.745	25,500,000
Italy	6,000,000	0.141	6,100,000
France	5,400,000	0.129	6,000,000
Japan	4,800,000	0.068	7,200,000
Germany	4,000,000	0.054	4,250,000
Norway	3,000,000	1.039	16,000,000
Switzerland	2,800,000	0.671	3,600,000
Sweden	2,200,000	0.351	4,000,000
U.S.S.R. (Russia)	1,707,000	0.010	78,000,000
Spain	1,400,000	0.056	5,700,000
Brazil	1,000,000	0.024	36,000,000
Great Britain and Northern Ireland	550,000	0.012	700,000
Finland	500,000	0.132	2,500,000
India and Ceylon	500,000	0.001	39,000,000

TABLE III

WATER POWER OF CANADA

Inventory by Province of Potential and Developed Water Power at the end of 1948

Provinces	Estimated Capacity in Horsepower at 80% Efficiency		Installed Capacity in Horsepower
	At ordinary Minimum Flow	At ordinary Six Month Flow	
Quebec	8,459,000	13,064,000	5,939,697
British Columbia	7,023,000	10,998,000	1,009,769
Ontario	5,407,200	7,261,400	2,894,240
Manitoba	3,309,000	5,344,500	503,700
Alberta	507,800	1,258,000	106,560
Saskatchewan	542,000	1,082,000	111,835
New Brunswick	68,600	169,100	133,347
Nova Scotia	20,800	128,300	140,884
Prince Edward Island	3,000	5,300	2,617
Yukon and N.W. Territories	382,500	813,500	28,069
Canada	25,722,900	40,124,100	10,870,718

St. Lawrence River

The total height of falls between Lake St. Francis and Montreal is 132 feet, of which 82 feet is above Lake St. Louis and about 50 feet below it. The first stretch is described as being the Beauharnois Section, and the latter as the Lachine Section.

At the present time the Beauharnois Central Station with its 14 units of 50,000 hp. each, uses the rapids of the St. Lawrence River in the Beauharnois Section. Its artificial canal has been designed to provide for future diversion of the entire flow of the St. Lawrence River, and to be utilized jointly for navigation and production of electrical power. $40 millions is presently being spent to enlarge the present plant by adding 12 new units of 50,000 hp. each. The extension will require a further diversion through the intake canal of Beauharnois, in part at the expense of the present flow used at The Cedars Plant, which has an installed capacity of 200,000 hp. These works are scheduled to be completed in 1951-52. When needed, the last step of the Beauharnois development will bring its total capacity to 2 million hp.

Due to the regulating effect of the Great Lakes, the St. Lawrence is one of the world's rivers that has the most uniform flow; its coefficient of irregularity being practically one to two. Its average monthly flow at Iroquois Falls in Ontario is 180,000 c.f.s. 90 per cent of the time, and 195,000 c.f.s. 75 per cent of the time. If we add the natural flow from the watershed between these points, we can figure a flow of 190,000 c.f.s. at Beauharnois, available 90 per cent. This would mean an available power at Beauharnois of about 1,520,000 hp.

For the Lachine Section, we must add to the above mentioned flow most of the flow of the Ottawa River. This river, which drains a territory of 56,000 square miles, empties into the St. Lawrence River by the following three outlets: The Mille Isles River on the North of Ile Jesus; the Des Prairies River between Ile Jesus and Montreal Island. These rivers join the St. Lawrence below the Lachine Rapids. The third branch flows into Lake St. Louis at the North Western extremity of Montreal Island.

During 1948, various schemes for development of the Lachine Section have been prepared by the Department of Transport, Ottawa, and by the Hydro-Quebec. These can be mainly classified as: (a) a combined navigation and hydro power project; (b) a single hydro power project. The development will require a complete control of the three outlets of Lake of the Two Mountains by means of three control dams. With such a control, a discharge of 220,000 c.f.s. would be possible at the proposed power plant, which could have an installed capacity of 1,200,000 to 1,500,000 hp. Using the controlled Lake of the Two Mountains as a pondage to take care of the daily maximum load, an installed capacity of 1,500,000 hp. would be justified. With a flow of 220,000 c.f.s. and a head of 50 feet, the available power in the Lachine Section can be estimated at 1,100,000 hp. at 88 per cent efficiency and 100 per cent load factor.

To summarize, there still exists an approximate potential of 2,000,000 hp. at 100 per cent load factor, of undeveloped water power on the St. Lawrence River, in the Province of Quebec, including the amount of 600,000 hp. presently under development.

St. Lawrence South Shore and Chaleur Bay Drainage

The Gaspé Peninsula

This is the prolongation of the Appalachian highlands which extend north-east from the State of Vermont. The mountains run close to the water. Some of them reach an altitude of 3,500 feet. About 90 per cent of this Peninsula is in forest. The heads of the rivers are at an altitude of 2,000 to 2,500 feet; watersheds of these rivers vary from 300 to 800 square miles. There is no important lake and practically no waterfalls on the streams and from head to the mouth they are a succession of rapids. Thus their flow is almost of a torrential type. No economical development can be made without regulated flows secured by storage reservoirs. Storage sites are hard to find and the development of the rapids is expensive. The minimum flow of these streams stands around 0.20 c.f.s. and the average annual flow should be about 1.70 c.f.s.

For the last four years, the Lower St. Lawrence Power Company has been feeding transmission lines from Ste. Félicité to Tourelle, a distance of about 55 miles. "La Coopérative de Gaspé", established in 1945, supplies energy in all the northern and southern parts of Gaspé, from Cap des Rosiers to Newport on the Chaleur Bay, with over 160 miles of transmission and distribution lines. "La Coopérative d'Electricité de Bonaventure" supplies energy on the Chaleur Bay from Gascon Cove to Nouvelle West, with over 100 miles of line.

This district is too remote to be fed from plants of the St. Maurice and the Saguenay. Consequently, as soon as the demand increases, it will be necessary to locate power sites in the district, even if their development is much more costly than those of the large power plants; otherwise the installation of steam power plants will be necessary. Government engineers are presently studying the possibilities of future developments on Madeleine River, the most important stream of the peninsula.

From Matapedia River to Chaudiere River

This section also contains a few important rivers for power. The head waters are also located in the Appalachian mountains and, after running through an undulating country, they flow into the St. Lawrence. There are a few important falls on these streams and a few lakes suitable for reservoirs.

The only rivers yet developed are the Metis, Riviere-du-Loup, Riviere du Sud, and the Chaudiere. On the Metis, the St. Lawrence Power Company operates two plants with a total installation of 15,000 hp. A storage dam at the outlet of Lake Metis provides a regulated flow. On the Riviere-du-Loup, there are three small plants; the first one is operated by the City of Riviere-du-Loup, and its installed capacity is about 1,500 hp.; the two others are operated for small pulp mills. A storage dam was erected at the outlet of Lake Morin about 40 years ago; it was rebuilt in concrete by the Quebec Streams Commission in 1942. The installed capacity on the Riviere du Sud is of the order of 5,000 hp.

The Chaudiere flows into the St. Lawrence 7 miles west from Levis. Its watershed spreads over 2,580 square miles and its course is 112 miles long. It has its source in lake Megantic at an altitude of about 1,300 feet. There are numerous rapids on it, but few important falls except Chaudiere Falls with a head of 114 feet; these falls are situated a few miles from the mouth of the river. The Quebec Power Company has developed 4,800 hp. at this latter site. The flow is almost of a torrential type: its minimum flow varies from 0.15 to 0.20 c.f.s. per square mile, and its average annual flow is about 1.75 c.f.s. per square mile.

The Megantic Pulp and Paper Company operates a 1,550 hp. power plant at the outlet of Lake Megantic and three feet of storage is used in the lake. The town of Megantic operates another plant of about 1,000 hp. a few miles below that of the Megantic Pulp; the Breakeyville Lumber Company has also a small plant of around 600 hp. at Breakeyville. The Rimouski River has rapids and falls which should be later developed. There are few lakes where storage dams might be built to regulate the flow.

From the Chaudiere to the U.S. border

This portion of the St. Lawrence watershed is undulating at the upper reaches of the main tributaries. They run through a flat country near the St. Lawrence. The two main rivers here are the St. Francis and the Richelieu. The watershed of the St. Francis covers an area of 3,930 square miles of which 555 square miles is in American territory. It has its source in Lake St. Francis at an altitude of 900 feet, and flows 140 miles to its mouth on the St. Lawrence.

The Quebec Streams Commission has built two storage dams, one at Lake St. Francis and one at Lake Aylmer. In normal years, these reservoirs secure a regulated flow of 1,200 c.f.s. below Lake Aylmer. The total capacity of the plants installed on this river is 85,875 hp. These are not sufficient to supply the several industrial centres of the region with power. The Southern Canada Power Company owns the principal plants on the St. Francis and has also to buy from the Shawinigan Company a large amount of energy to meet the power demand.

The City of Sherbrooke operates two power plants also on this river. Eight more power sites, giving a total head of about 320 feet, are not yet developed. The relatively high cost of development of these falls and rapids prevents Southern Canada Power Company from harnessing the sites it has under lease. They prefer buying energy from the Shawinigan plants to developing their own power sites.

The Richelieu is one of the largest tributaries of the south shore drainage of the St. Lawrence. Its watershed covers an area of 9,200 square miles of which a sixth lies in the province of Quebec. It rises in Lake Champlain which is almost completely in the United States, and has no importance at all as far as water power is concerned.

In the "List of Water powers of Quebec", the total capacity of the St. Lawrence south shore drainage and the Chaleur Bay drainage streams, at an ordinary six months' flow, is shown at about 308,130 hp., and the installed capacity up-to-date is about 200,000 hp. On the whole, this region includes hardly 3 per cent of the hydraulic resources of the Province, and the development of its rapids and falls is costly compared with those of the north shore of the St. Lawrence. Also only about 3 per cent of the total capacity of the plants in the province are located in this country.

St. Lawrence North Shore Drainage

This is part of the Laurentian Plateau which reaches as far north as Hudson Bay, and comprises more than 90 per cent of the area of the Province. The north shore watershed of the St. Lawrence has an approximate length of 1,100 miles and an average width of 200 to 300 miles, stretching out from the head of Lake Temiscamingue to Blanc Sablon on the Straits of Belle-Isle. The altitude of the height of lands varies between 1,200 and 2,000 feet.

Excepting for the settled area parallel to the St. Lawrence, which is flat, the plateau is partly undulated, partly rugged, and covered by forest. Most of the mountains do not rise higher than 2,000 feet except in the eastern part of the Province on what is commonly called "The North Shore", where they sometimes reach 3,000 and 3,500 feet. This watershed presents good opportunities, on its many lakes, for reservoirs.

In this drainage basin are some large rivers such as the Ottawa with a watershed of 56,000 square miles; the Saguenay with 36,000 square miles; the St. Maurice with 16,000 square miles, and the Manicouagan with 18,900 square miles. Many small falls and rapids, separated by stretches of still water, can be found on these rivers. The falls are seldom higher than 100 feet, and range between 50 to 75 feet; but the erection of dams would usually permit concentration of heads of 100 to 200 feet including the natural slope of the river.

The minimum natural flow of the larger rivers is approximately 0.30 c.f.s. per square mile, being slightly lower in winter than in summer. Their yearly average flow stands between 1.40 and 1.75 c.f.s. per square mile. Depending on the type of river, the variation of flow in a normal year can be thus classified: 1 to 30 for large rivers, 1 to 50 for middle-sized rivers, and 1 to 100 for small rivers. In abnormal years the variation is even larger. The rivers of the north shore drainage area differ widely from those in the south shore drainage area, and represent almost 97 per cent (including the St. Lawrence) of the 5,800,000 hp. installed in the whole St. Lawrence watershed.

Ottawa River and Tributaries

This watershed covers 56,000 square miles. The head waters are in Lake Victoria, at an altitude of 1,060 feet above sea level. Quite a few storage dams have been built on the lakes within the watershed of the Ottawa. About 90 per cent of the area is land covered by forests. The falls and rapids between Lac Temiscamingue and Lake of the Two Mountains are jointly owned by Ontario and Quebec.

The most important storage dams built in this watershed, on the Quebec side, are the concrete dam on Lake Dozois upstream from Lake Victoria, built by the Quebec Hydro-Electric Commission in 1948; the concrete dam at Rapid Seven, on the Upper Ottawa, partly used for storage though primarily a power dam operated by the Quebec Hydro-Electric Commission; two concrete dams on Lakes des Quinze, Temiscamingue and Kippawa, built by the Federal Government around 1910; Mercier dam on the Gatineau built around 1926 by Gatineau Power Company; timber dam on Lake Cabonga built around 1928-29 by Gatineau Power Company; concrete dam on La Lièvre river built by MacLaren Power Company, operated since 1930; and the concrete dam on La Lièvre river built by MacLaren Power Company, operated since 1942.

If in the future it is found necessary to get more storage, other sites for dams are available, notably at the outlet of Lake Victoria. The flow of the Ottawa at Carillon is now regulated at approximately 35,000 c.f.s. for 90 per cent of the time.

The purpose of these reservoirs built by the Federal Government was mostly centred around navigation and the driving of logs. At this time there were only a few hydro-electric plants on the Ottawa and the driving of logs has a greater importance than the generation of power. In the past the driving of logs over natural obstacles (waterfalls, etc.) in the river required a certain amount of water for that purpose only. As a consequence of the development of power and present and future storage, it seems that it will be possible to regulate the flow at Carillon at over 40,000 c.f.s., that is at 0.71 c.f.s. per square mile of drainage basin and, in the Upper Ottawa River, it appears that the possible regulation will be approximately 1.5 c.f.s. per square mile of drainage basin.

Some of the larger tributaries are also well regulated. The main ones are the Gatineau and the Lièvre. The former has a watershed of 9,100 square miles and a regulated flow of over 1.0 c.f.s. per square mile due to the storage dams at Mercier and Cabonga. The latter has a watershed of 3,700 square miles and a regulated flow of over 1.0 c.f.s. per

TABLE IV

TOTAL AVAILABLE AND INSTALLED WATER POWER IN QUEBEC ACCORDING TO THE PRINCIPAL BASINS

Drainage Basin	Estimated Capacity in HP. at 80% Efficiency①		Installed turbine capacity in H.P. as of January 1st, 1949.②
	At Ordinary Minimum Flow	At Ordinary Six Months Flow	
St. Lawrence River	2,060,000	2,340,000	1,008,988
St. Lawrence North Shore:			
(a) Ottawa River Basin	1,004,558	1,602,505	1,222,397
(b) St. Maurice River Basin	1,080,622	1,126,254	1,141,650
(c) Saguenay River Basin	1,262,194	1,534,008	2,130,496
(d) Other Basins	1,320,381	2,693,627	184,350
St. Lawrence South Shore	184,833	303,598	189,943
Chaleurs Bay	1,337	4,534	2,178
St. John River	79	267	......
James Bay	1,037,665	2,445,287	3,360
Hudson Bay	250,334	500,669	......
Ungava Bay	260,900	521,800	....
Total	8,462,903	13,072,549	5,883,362

①As given in the 1928 inventory of the Water Powers in the Province of Quebec.
②Does not include inactive installed capacities.

TABLE V

AVAILABLE AND INSTALLED WATER POWERS OF THE OTTAWA RIVER AND MAIN TRIBUTARIES

Main Rivers	Estimated Capacity in HP. at 80% Efficiency (1928 Inventory)		Estimated capacity in HP. at Foreseen Ultimate Regulated Flow and at 88% Efficiency	Present Installed Turbine Capacity in HP.
	At Ordinary Minimum Flow	At Ordinary Six Months Flow		
Ottawa①	474,981	836,114	1,001,000	290,400
Gatineau	326,467②	336,135②	300,000	506,500
Du Lievre	63,289	138,064	191,000	286,420
Total③	864,737	1,310,313	1,492,000	1,083,320

①The Ottawa River from Lake Temiskaming to Carillon forms the boundary line between Ontario and Quebec. The Power Sites on this reach of the river include the sites from Fourneau to Carillon and are inter-provincial. Their estimated available power as included in the above mentioned total are for the Province of Quebec only.
②As to the Gatineau River the estimates of power for the sites below Maniwaki are based upon flows which, at the time of the 1928 inventory, were expected to be achieved from regulation.
③Are not comprised in this table the available water powers of the Gatineau River above Maniwaki, nor those of the Lievre River above Buckingham, nor those of the other tributaries of said Ottawa River.

square mile, due to storage at Cedar Lake and Mitchinamikus.

Table V indicates the available and developed water power of the Ottawa River and main tributaries. All the smaller rivers have been omitted, since they represent only a few hundred thousand horse-power and would be developed only for local needs.

The St. Maurice River

This river is over 300 miles long and the area of its drainage basin is approximately 16,200 square miles. A series of great lakes, located 250 miles above its mouth, constitutes its source at an approximate altitude of 1,300 feet. The topography and physical characteristics of the watershed are similar to those of the Ottawa; over 90 per cent is covered by forests and could not be utilized for agriculture.

The natural minimum flow of the St. Maurice at Shawinigan Falls is 6,000 c.f.s., and the average annual flow is around 1.60 c.f.s. per square mile of its drainage area. The flow of this river is regulated by three great storage reservoirs:

1. Gouin Reservoir: one of the largest in the world, with a storage capacity of 9,600 square-mile-feet, was completed in 1918;
2. The A, B, C dams and others on the Manouan river, one of the largest tributaries of the St. Maurice, form another storage system. Built during the period 1908 to 1915, the combined capacities of these dams aggregate 1,320 square-mile-feet.
3. Mattawin Dam: In 1930 a third reservoir came into operation on the Mattawin River, another tributary of the St. Maurice. This reservoir impounds some 1,005 square-mile-feet.

Through the operation of these large reservoirs and of some others of less importance the regulated flow of the St. Maurice River, at Shawinigan, is now approximately 19,200 c.f.s.

The first hydro-electric plant on this river was built at Shawinigan Falls by The Shawinigan Water & Power Co. This plant, begun around 1898, was completed in 1903 with an installed turbine capacity of 10,000 hp. The total installed capacity of the hydro-electric plants built by the Shawinigan Water & Power on this river presently amounts to 1,140,000 hp. The sites of these plants and their characteristics are given in Table VI.

TABLE VI

Power Developments on the St. Maurice River

Site	Head in Feet	Present Installation in h.p.	Proposed Additional Installation in h.p.
La Gabelle	60	172,000	....
Shawinigan Falls	145	345,000	144,900
Grand'Mere	80	201,000	....
La Tuque	114	222,500	44,500
Rapide Blanc	112	200,000	40,000
La Loutre	...	1,500	....
Total	511	1,141,650	229,400

TABLE VII

Undeveloped Power Sites on the St. Maurice River

Site	Head in Feet	Proposed Ultimate Installation in hp.
Sans Nom	110	252,000
La Trenche	160	384,000
Des Coeurs	70	112,000
Du Lievre	83	124,000
Allard	87	132,000
Total	510	1,004,000

At the falls known as "La Trenche", a power plant of 384,000 hp. is being erected at an estimated cost of $30 millions. The first units are expected to be in operation by 1951. The same Company holds a lease from the Provincial Government for other important sites which will be developed gradually as the demand increases. The characteristics of these proposed developments are given in Table VII. When these projects are built and additions made to the existing plants, the total capacity of the plants on the St. Maurice will be approximately 2,300,000 hp.

The energy derived from the river is supplied to the domestic, commercial and industrial load of the St. Maurice Valley. Shawinigan, and its subsidiary, Quebec Power, feed the north shore of the St. Lawrence from St. Siméon, near the mouth of the Saguenay, to Montreal and the south shore from Sorel to (but excluding) Rivière du Loup, the Beauce region, and part of the Eastern Townships.

The Saguenay

The watershed of this river at its mouth covers an area of about 36,000 square miles; at the outlet of Lake St. John it drains 30,000 square miles. It begins in Lake St. John, which has an area of approximately 400 square miles, at an altitude of 320 feet. Among the largest tributaries which feed this lake we should mention: the Peribonca River with a drainage area of 12,000 to 14,000 square miles; the Mistassini River, with 5,360 square miles; the Ashuapmuchouan with its 5,550 square miles of basin. These tributaries are more than 95 per cent wooded and uncultivated. They border upon those of the St. Maurice River, the rivers of the lower St. Lawrence north shore and those of James Bay.

The minimum flow of the Saguenay in its natural state varies from 10,000 to 12,000 c.f.s.; its average flow is around 1.80 c.f.s. per square mile. Three large reservoirs insure its regulation; Lake St. John storage dam, Passe-Dangereuse storage dam on the Peribonca River, and one at Manouane Lake on the Manouane River, a tributary of the Peribonca. Through the operation of these reservoirs, the firm flow of the Saguenay is kept at around 42,500 c.f.s.

Two large hydro-electric plants use the 320 feet drop of the Saguenay river; the first, at Isle Maligne, 6 miles downstream of Lake St. John, utilizes from 100 to 115 feet; the second, at the mouth of the Shipshaw, six miles above Chicoutimi, is commonly called Shipshaw or Chute à Caron No. 2. At Isle Maligne the installed capacity is 540,000 hp.; at Shipshaw it is 1,200,000 hp. A third plant, at the foot of the Chute à Caron dam, has a capacity of 280,000 hp. under a head of 165 feet. Built before Shipshaw as a temporary plant, it is now used in cases of emergency or when there is a surplus of water.

The first 20 miles of the Peribonca river form a group of falls and rapids giving a total head of 180 feet. These falls and rapids could be concentrated in two developments of about 100 feet each. Another project for developing this river would be to erect a dam about 60 feet high at the head of the second last fall and by means of a canal 7 miles long to divert the flow towards the Chicot stream which flows into the pond above the Isle Maligne plant. A plant at the mouth of this stream would have a capacity of 300,000 to 400,000 hp. under a head of 220 feet.

The Mistassini and Ashuapmuchouan rivers have many falls or rapids, but the storage possibilities have not yet been thoroughly studied. According to those who explored this country, it seems doubtful that convenient sites for large storage dams could be located on those rivers. Depending on reservoir possibilities, those two rivers might furnish water power to the extent of 100,000 hp. each.

The Lower St. Lawrence North Shore

The part of the Province commonly called "North Shore", here referred to as the "Lower St. Lawrence north shore", extends from the mouth of the Saguenay River to Blanc Sablon on the Straits of Belle-Isle, approximately 600 miles in a straight line. From Tadoussac to Baie Comeau a road skirts the shore at the foot of the mountains which form part of the Laurentian Plateau. The greater part of this region is unsuited for cultivation but is forested. A certain portion, chiefly beyond the 52nd parallel of latitude, is arid. The population of this area is about 30,000; the majority of the inhabitants are occupied in forestry and fishing.

As far as can be judged by maps, this territory is covered with many lakes, which will permit the regulation of its large rivers. The heights of land are at an altitude varying from 1,800 to 2,000 feet. The rivers are from 150 to 350 miles long. Among the most important ones are the Manicouagan, the Bersimis and the Romaine, etc.

The Quebec North Shore Paper Company operates, at Baie Comeau, a 400-ton pulp and paper mill. For supplying power a hydro-electric plant was built on the Outardes River 15 miles from Baie Comeau; its installed capacity is 77,500 hp. under a head of 220 feet. Studies have been made for regulating this river by storage dams at lakes Plétipi and Tétépiskaw; it appears that with only these two dams it would be possible to obtain a firm flow at the above site giving approximately 120,000 hp. The most important tributaries of this drainage basin are shown in Table VIII.

There are few statistics available on the flow of these rivers except for that of the Outardes. Data collected by the Quebec North Shore Paper Company, between 1931 and 1941, show that the minimum annual flow for the Outardes is 2,720 c.f.s. or 0.43 c.f.s. per square mile, the average annual flow is 14,520 c.f.s. or 2.3 c.f.s. per square mile. There is no doubt as to the accuracy of the above figures for flow proper, but since the drainage areas are not yet well defined, the characteristics per square mile cannot be taken as final. It is highly probable that the drainage area of the Outardes River exceeds 6,300 square miles. According to a preliminary study in 1929, by F. B. Brown, Engineer of Montreal, it would be possible to regulate the Manicouagan river at 20,000 c.f.s. and to build five power plants thereon having a total capacity of 1,800,000 hp. at a very low cost per hp.

As for the Bersimis, we know that, from the 45th mile above its mouth up to Lake Pipmaukin, a distance of 80 miles, there is a drop of 1,200 feet and that it is possible to install 3 power plants which could use about 1,000 feet of head. Almost one million hp. would be available by storing water at Lake Pipmaukin. In its natural state, this lake has an area of 95 square miles and a drainage basin of almost 5,000 square miles. The steepness of its shores makes possible a storage height of 80 feet or more, if necessary, which would insure a regulated flow of 8,000 to 10,000 c.f.s. on the Bersimis, even during years of lower flow.

On the Romaine, within a radius of 80 miles from the Gulf of St. Lawrence, there are four falls and rapids of 100 feet or more, and some intermediate ones of less importance. For the first 175 miles following the course of the river, the 1928 Inventory gives a total head of 870 feet; these 175 miles lie within a distance of about 125 miles from the Gulf. On the other hand certain maps show numerous important lakes, which could be used advantageously as reservoirs. We are thus inclined to evaluate the potentialities of this river at nearly three-quarters of a million hp.

James Bay, Hudson Bay, Ungava Bay

This territory lies almost entirely within the Laurentian plateau, and most of the mountains are close by the sea. There are many important streams in this area, some of which are bigger than the St. Maurice and some almost the size of the Saguenay. On these rivers are found many falls and rapids, separated by stretches of still water. The heights of land between those rivers and the St. Lawrence north shore drainage are situated at an altitude from 1,200 to 2,000 feet. The whole territory is covered with many lakes, some of which are quite important, particularly in the Ungava Bay and the James Bay drainages. It is known by those who flew over the region that there are numerous lakes. The more remote areas are still not yet well known.

TABLE VIII

Available Water Power in the Main Drainage Basins of the Lower St. Lawrence North Shore

River	Drainage Area in square miles	Estimated Capacity at 80% Efficiency at Ordinary Six Months Flow (1928 Inventory)	
		Main River	Main River and tributaries
Manicouagan	18,900	796,314	922,144
Outardes	6,300	83,312	84,586
Bersimis	6,460	362,701	378,546
Romaine	7,700	295,062	321,850
Moisie	8,000	35,461	42,068
Natashquan	6,690	130,681	130,681
Total	....	1,703,531	1,879,875

TABLE IX

Available Water Power on the Main Rivers of the James Bay Drainage Basin

River	Drainage Area in square miles	Estimated capacity in HP. at 80% efficiency at Ordinary Six Months Flow (1928 inventory)
Harricana	13,600	335,440
Nottawa	24,018	836,091
*Rupert	16,000	520,280
East Main	25,400	397,800
Big River	27,184	99,002
Others	.....	256,674
Total	.....	2,445,287

*This river has its source in Great Lake Mistassini covering an area of about 1,000 square miles and with a watershed of about 6,200 square miles.

Maps show the principal streams, but only a few tributaries are indicated, so that the superficial areas of these different drainage basins are not exactly known. It follows that the figures set down in the list of the water powers of 1928 are approximate, and give only a rough estimate of the water power available. Above latitude 52° the major part of the territory, except the James Bay drainage area, becomes more and more barren. The forest is confined to the valleys of the rivers in the vicinity of that latitude, and it disappears as we go further North. There are several important rivers in the James Bay drainage. These are shown in Table IX.

Hudson Bay Drainage

As we go further north the maps become less accurate and we have less information, so that it becomes difficult to estimate the possible water power on these rivers. From the 1928-Inventory, the principal stream is the Great Whale River, which has a watershed covering about 24,200 square miles. The capacity of its water power, according to the same list, is given as 442,699 hp. With storage, this estimate could certainly be increased.

Ungava Bay Drainage

Maps show four large rivers which flow into this bay; the Koksoak, Fort Georges, Baleine and Aux Feuilles Rivers; among which the Koksoak is by far the most important. According to maps published recently by the Federal Government from aerial surveys, the lakes area of this watershed seems larger than those of the north shore drainage of the St. Lawrence. The 1928-Inventory gives but a rough estimate on the possibilities of the Koksoak. Its watershed covers around 34,720 square miles; at ordinary six months flow the estimated capacity is 521,800 hp.

This drainage basin borders upon those of the Atlantic, the St. Lawrence and James Bay; it is divided into two branches; one running South-North: the Kaniapiscau River; the other East-West. From a survey done by the Quebec Streams Commission there would be at Eaton Canyon on the Kaniapiscau, a 335 foot fall over a distance of 2 miles; the flow, as found in April 1948, was 5,100 c.f.s. which would correspond approximately to the minimum flow.

As the drainage basin at this site is 17,000 square miles, we obtain 0.30 c.f.s. per square mile, which corresponds pretty well with the minimum flow of our large rivers on the north drainage of the St. Lawrence. One would think that, due to the scarcity of vegetation, the minimum flow would be low, but the multitude of lakes in this territory compensates for the lack of forest. From the above we may then assume that the falls and rapids of Eaton Canyon will give at least a minimum capacity of 168,000 hp., and by comparison with the characteristics of the St. Lawrence north drainage rivers we may evaluate the capacity of this site, at ordinary six months flow, at 350,000 hp.

On the other hand, if we consider the large lakes upstream of Eaton Canyon, we may assume that this river can be regulated to at least 1 c.f.s. per square mile, which would give a possibility for this site of at least 500,000 hp.

As there are many other important falls and rapids the Koksoak and the Kaniapiscau, the potentiality of the whole Ungava Bay watershed could be considered as being around 2,000,000 hp.

Summary and Conclusions

In brief the total installed capacity of turbines in the Province of Quebec to date is close to 6,000,000 hp. and developments representing about 1,000,000 hp. are, at present, in different stages of completion. These are located on the St. Lawrence at Beauharnois, on the St. Maurice at La Trenche, and on the Quinze. Some important developments are being planned for the future especially on the Manicouagan by the Quebec North Shore Paper Co., and on the Kaniapiscau in the territory of Ungava Power Co. a subsidiary of the Hollinger interests, for use in the iron mines of the area.

The largest hydro-electric plants in the Province are located on the St. Lawrence, the Ottawa, the Gatineau, the Lièvre, the St. Maurice and the Saguenay. The total capacity of these plants stands at slightly over 5,000,000 hp., varying in capacity between 40,000 and 1,200,000 hp. Smaller plants located on smaller rivers, in sizes of between 500 hp. and 30,000 hp., form the remainder of slightly under 1,000,000 hp., that makes up the total of almost 6,000,000 hp. installed. About 3 per cent of the total installation in the province is within the south drainage area of the St. Lawrence, the remaining 97 per cent being on the St. Lawrence itself or in its north shore drainage area.

In the 1928-Inventory, the total potential of water powers of Quebec, at ordinary six months flow and at 80 per cent efficiency, was estimated at 13,000,000 hp. Less than 3 per cent of this amount is located in the south shore drainage area of the St. Lawrence, about 70 per cent on the St. Lawrence and in the north shore drainage area, and nearly 30 per cent in Ungava. Since the publication of this inventory, there has been made available a great deal of information not known at that time. Some rivers of the James Bay and north shore drainage areas have been surveyed by the Provincial Department of Lands and Forests, the Quebec Streams Commission and, during and since the war, numerous aerial surveys have been made over the whole territory of Ungava by the Federal Government.

This work is continuing but lack of technical personnel has delayed the publication of new maps. It is hoped that, in a few years, they will be available. Furthermore, it is to be hoped that in a few years some daily readings be made of the levels and flow on some of the main rivers of the north Shore of the St. Lawrence, below the Saguenay and of James Bay, for bringing the Inventory up-to-date.

According to the latest preliminary information, many rivers as large and as important as those within the north shore drainage area of the St. Lawrence are located in the territory of Ungava which is covered with many lakes. Falls and rapids are as plentiful on these rivers as on those of the north shore All these rivers are on the Laurentian plateau, their sources are approximately at the same altitude, and the characteristics of their watersheds differ but slightly from those of the north shore drainage area of the St. Lawrence.

We have shown what has been done, and is expected to be realized shortly, in normal years, in way of regulation of the rivers in the north St. Lawrence drainage area. Here regulation ranges between 1 c.f.s. per square mile of watershed on the Gatineau and Lièvre rivers at Chelsea and High Falls, up to 1.25 c.f.s. on the St. Maurice at Shawinigan Falls, 1.4 c.f.s. on the Saguenay at Shipshaw, and 1.5 c.f.s. on the upper Ottawa.

Assuming that on the lower St. Lawrence north shore and in

Ungava it is possible to regulate the main rivers only from 0.8 c.f.s. to 1 c.f.s. per square mile of watershed, this will mean an increase of firm power of over 33 per cent of the potential water power valuation of 1928- at six months flow.

Equally good results should be achieved on many of the rivers in Ungava. More accurate data on these rivers will show that the potential power with storage reservoirs would exceed the 3,466,956 hp. estimates of 1928 with six months flow, by at least 1,000,000 hp. in the James Bay watershed and 1,500,000 hp. in the Ungava Bay watershed. For the same reason, we could add at least 1,000,000 hp. to the estimated capacity of 1928 for the north shore rivers from Tadoussac to Blanc Sablon.

With storage reservoirs we know that on the St. Lawrence, the Ottawa, the St. Maurice and the Saguenay Rivers there are approximately 1,500,000 hp. over and above the estimates of 1928. These estimates published in 1928 were based on regulated flow from storage, only where storage dams had been built at that time. *It would therefore be conservative to state that the potential firm power of the Province, with the proper storage of water, is 18,000,000 hp. as compared with 13,000,000 hp. as estimated in the 1928 Inventory, which gave 8,000,000 hp. of primary power plus 5,000,000 at six months flow.*

We may therefore conclude that we still have sufficient reserve of water power for many years to come. Moreover these water powers are scattered throughout the Province in such a way that each region may be served by developing a large river without any long transmission lines, except for the south shore of the St. Lawrence between Rivière du Loup and the tip of the Gaspé Peninsula. In this latter area both the water powers and the lakes where storage is possible are of prime importance for its future economy. For how long will the central part of the Province be self-sufficient in electrical energy? In 1952-53, the installed capacity in the Province will be almost 7,000,000 hp., practically all located centrally in the St. Lawrence Valley between Tadoussac and Hull. In this area, there is still about 3,500,000 firm hp. to be developed which would justify an installed turbine capacity of about 4,500,000 hp.

It is difficult to anticipate the demand for energy in this region 25 years hence but, over the past 40 years the demand, though irregular, has practically doubled every ten years on an average. The installed capacity in 1910 was about 250,000 hp. It will reach nearly 7,000,000 hp. by 1952-53. The two last wars have intensified the development of our water powers and the industrialization of our Province.

It is probable that the increase in demand for energy will slow down during the next decade, but supposing that in the next twenty or twenty-five years it only increases half as fast as it has in the last 40 years, all that is left in the central part will be taken up by 1975, including approximately three quarters of a million hp. which is exported to Ontario, under contracts expiring about 1970-72.

By then we will have to transmit power from the Bersimis and the Manicouagan, as some industries will of necessity have to be located in the centre of the Province, to be close to the markets they will be serving. These two rivers are from 250 to 300 miles below Quebec City.

Alternately, we may then have to bring power from the rivers of the James Bay area. Some water-powers on these rivers are only about 300 to 350 miles West of Lake St. John.

The important hydro-electric plants have naturally been built on the large rivers where it was possible to have a regulated flow, because storage is a necessary adjunct to the economic development of our falls and rapids. In general, without storage reservoirs, the cost of power at our plants would be almost double what it is. Up to now, construction on the large hydro-electric plants on regulated rivers has cost on an average between $80.00 and $100.00 per horse-power installed. With the present high cost of material and labour it is obvious that this cost will be increased. Small plants cannot compete with these large installations, except where the cost of transmission compensates for the difference in ultimate cost of energy.

Later on in the central part of the Province the water powers on the smaller rivers will have to be developed even at a cost of$200,000 and $300,000 per hp. or more, especially in the Lower St. Lawrence south shore area and in the Gaspé Peninsula, as this district is too far away to be fed by the big power plants of the St. Maurice, Saguenay and St. Lawrence.

As stated before the lack of technical personnel during the war and since has slowed down the field work of investigation, but when this scarcity is overcome, more impetus should be given to speed up in the north shore and James Bay areas, surveys of rivers and lakes, profiles and gauging of rivers, etc., in order to have the requisite data on hand when it becomes necessary to study the future requirements for power.

Quebec's Undeveloped Mineral Resources

A paper presented at the Sixty-third Annual General and Professional Meeting of The Engineering Institute of Canada, May 11-14, 1949.

by

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This paper, published by permission of the deputy minister, Department of Mines, Quebec, calls attention to the difference between mineral and other resources. The author delimits the geological subdivisions of the province, giving area and mineral production of each, namely the Laurentian Plateau, (including the Temiscamian and Grenville sub-provinces), the St. Lawrence Lowlands, and the Appalachian region. Noting that the discovery of processes for utilization of apparently worthless minerals is equally important to the discovery of new ore bodies, he expresses confidence that progress of Quebec's mining industry will remain proportional to efforts in the search for new deposits.

It is apparent that undeveloped mineral resources present a characteristic which separates them sharply from undeveloped water power resources or undeveloped forest resources. Generally speaking, mineral resources are not open to inspection.

An explorer whose wanderings lead him close to a water fall can first hear it, then he can see it. If he considers it of some interest, he may add it to a list compiled from his observations and those of his predecessors and contemporaries. Later, as the frontiers of the unsettled areas are rolled back and centres of industrialization approach the location of the fall, farsighted promoters or manufacturers will be tempted to investigate the site more closely; they will engage engineers and experts to survey this ' undeveloped resource '. The point that I wish to emphasize is that before the possible power site had become an ' undeveloped resource ', someone had seen it, had noted it, and had probably described it. Whether or not to develop the site may be a very complex economic and engineering problem, but the fall itself is there for all to see. Its existence is common knowledge.

Similar remarks are applicable to our forest resources. The trees too are there for all to see. Nowadays we can even photograph them, with surprising accuracy and detail, from planes that travel at one hundred miles per hour. Study of the pictures, supplemented by well chosen traverses run by expert timber cruisers, permit at least preliminary appraisal of these " undeveloped resources ".

Undeveloped mineral resources on the other hand, may (and I am sure do) exist, but *not* where all may see them. For in large part, our mineral resources are scattered here and there throughout the crust of the earth, where they constitute concentrations extremely small compared to the total volume of the rock formations.

The surface of bedrock affords a single cross-section of these rock formations, and if the deposits in which we might be interested lie completely below this natural section, only most unusual luck or skill will ever locate them. Still worse, in our Province, about ninety per cent of this single available section is effectively concealed by surficial deposits — overburden, soil, moss and water.

All things considered, our prospectors have to meet very adverse conditions. The success so far achieved is remarkable and highly encouraging, but at the same time even slight acquaintance with these conditions leads to the conviction that many more mines remain to be discovered, even in areas that have most attracted the attention of prospectors. Perhaps this is just as well; it would be impossible to over stress the fact that developed mineral resources are wasting assets, and the deposits we mine are the cream of a crop that took a thousand million years to mature. Future generations will doubtless be grateful that nature has supplied a brake to our desire to reap more than our share of the harvest.

Geological Sub-Divisions

The total area of the Province of Quebec is given as 594,534 square miles. Geologically this vast area may be divided into three regions or units that are remarkably distinct. These three geological units are also physiographic divisions

They are by no means equal in size, since the largest, the Laurentian Plateau, occupies about 93 per cent of the area of the Province, whereas the St. Lawrence Lowlands account for barely two per cent; the Appalachian region makes up the remaining five per cent. The mineral resources, developed and undeveloped, of each of these are different, and must therefore be treated separately.

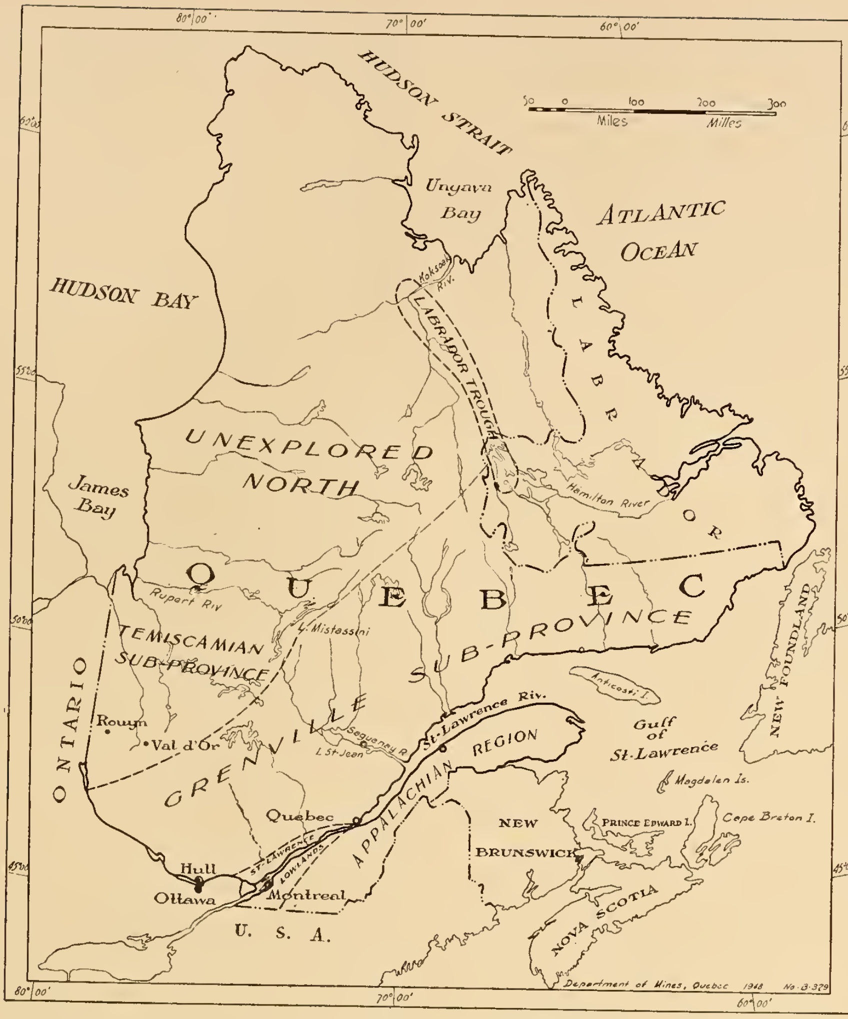
Laurentian Plateau

The Laurentian Plateau in the Province of Quebec extends northward to Hudson's Bay and Strait. The southern boundary is a sinuous line extending from Ottawa to Quebec, and to the east of Quebec it follows the north shore of the St. Lawrence river; this southern boundary is well marked by an escarpment commonly referred to as the Laurentian Hills.

This Laurentian Plateau of Quebec forms part—almost one third in fact—of the Canadian Shield, of which the mineral resources are a factor of prime importance in the economy of the country. To appreciate this, it will suffice to call to mind the gold-copper and zinc deposits of Western Quebec; the gold mines of Porcupine, Kirkland Lake and Little Long Lac in Ontario; the silver deposits of Cobalt; the great copper-nickel mines of Sudbury; the iron deposits of the Lake Superior region and New Quebec; the iron-titanium deposits of the Allard Lake area; the silver-uranium and the gold deposits of the North West Territories; the zinc-copper deposits of Manitoba; all these and many other minor deposits lie in the Canadian Shield, nearly one third of which, I repeat, lies in the Province of Quebec.

Furthermore, it is pertinent to point out that of this vast area—over half a million square miles—only the southern fringe has been partially explored; 85 per cent is virgin territory as far as the geologist or the prospector are concerned. It is tempting to speculate on the undeveloped mineral resources of this vast region, but the simple truth is that they are unknown. There is, however, no reason why this unexplored part of the shield should be less well endowed than the rest; and only most unjustifiable pessimism could inspire doubt that it contains its share of major mineral deposits as yet undiscovered and undeveloped.

With the exception of very small areas of later sedimentary formations, all the rocks of the Laurentian Plateau are Pre Cambrian, the oldest of the earth's crust. In the Province of Quebec, it is in the south western corner of the Laurentian Plateau that geological mapping has progressed most; the greater part of our population is concentrated in the southern portion of the Province, and quite naturally we have first sought to develop the mineral resources nearest to our door steps.



GEOLOGICAL SKETCH-MAP OF PROVINCE OF QUEBEC

In this corner of the plateau, two distinct geological units have been distinguished, and designated respectively as the Temiscamian and the Grenville sub-provinces. In each are found characteristic formations that reflect different geological histories. The boundary between the two is a zone of deformation or faulting with granitic intrusions, which in Quebec has been traced northeastward from the south end of lake Temiskaming to the area to the east of Mistassini Lake; beyond this the boundary loses itself in the realm of unexplored territory. Towards the southwest the boundary has been traced in the Province of Ontario as far as Georgian Bay.

The Temiscamian sub-province lies to the northwest of the contact-zone, and extends northward to the 50th parallel of latitude; the Western Quebec mining belt in Temiskaming and Abitibi counties lies wholly within it. The Grenville sub-province lies to the southeast and includes Pontiac, the areas to the north of Ottawa, Montreal and Quebec, the Lake St. John district and the north shore of the St. Lawrence; it occupies a much larger part of the Province than does the Temiscamian sub-province.

Temiscamian Sub-province

So far, more than forty producing metal mines have been developed in the Temiscamian sub-province in Quebec, and of these, 29 were in operation in 1948. Last year, these mines produced gold, copper, zinc and minor amounts of other metals having a value nearly $61 millions, or more than 40 per cent of the value of our total mineral production which has been estimated at $147.4 millions.

It is of interest to note in passing that twenty-five years ago, before the development of the western Quebec mining belt, the value of our production of metals was 1¾ per cent of our total mineral production, valued at $19 millions. At that time, exploration on the Horne property gave indications of events to come, but this was the only occurrence in the whole belt that could be referred to accurately as an 'undeveloped mineral resource', and even there the estimates of the deposit were given as 600,000 tons of ore of a gross value of $12½ millions. By 1948, this great mine had produced a cumulative total of 1,269,931,985 pounds of copper, 4,591,540 ounces of gold, and the management still could report ore reserves of nearly 20 million tons.

In the western Quebec mining district there are three main types of deposits: 1) complex gold bearing sulphide masses mined for copper or zinc. Noranda is the largest of these. Two new ones, Quemont and East Sullivan, will soon join the ranks of the producers; 2) replacement deposits of irregular shape localized by shear or fracture zones, mined for gold, in which the accompanying sulphides — mostly pyrite — are disseminated and no attempt is made to recover them. The Beattie, in Duparquet township, and the Malartic group of mines in Fournière township, are typical examples; 3) gold bearing quartz veins. Most of the mines in the Val d'Or district, and the Belleterre in Guillet, belong to this group; so too do many of the mines in the Rouyn district.

The molybdenite deposits of Preissac and Lacorne townships constitute a fourth type of economic mineral occurrence in the district; two of these have been mined on a small scale.

At some places, the distribution of the deposits suggests that there is a genetic correlation between ore and certain intrusive rock types, but generally speaking no correlation has been established between ore and any particular rock type.

All but half a dozen of the producing mines, both of base metals and of gold, lie in a belt within a distance of a few miles of the major Kirkland Lake—Val d'Or fault zone, which in Quebec extends from the Ontario boundary to beyond Val d'Or, a distance of about 125 miles. It appears to be terminated by the major northeast trending zone of disturbance that separates the Temiscamian and Grenville sub-provinces. The deposits are not necessarily localized in the fault zone itself, like beads on a string, but rather they appear to be related to the minor fractures subsidiary to the 'main break'.

This of course greatly enlarges the field for search for other deposits, since the belt of favourable prospecting ground is wide. As usual, overburden is the rule, rock exposure the exception. The deposits are commonly associated with zones of fracture, which are zones of weakness, most easily eroded to form depressions where the overburden is now the thickest. Thus the most promising areas are those in which conditions for exploration are the least favourable.

As a result of all these factors, the search for new deposits is expensive. The cost of appraisal of undeveloped forest resources with the aid of aerial photographs may be measured in tens of dollars per square mile, but in mining exploration it is not unusual to spend hundreds of dollars per acre to establish the existence of orebodies that constitute proven undeveloped mineral resources. This may explain in part why such resources seldom remain long undeveloped. By the time their existence is proven, the principals bend every effort to their rapid development so that they can get return on an investment that is already large. Fortunately, although the cost is high the reward to the successful is proportionally great.

It would be highly presumptuous to try to undertake here to point out the most likely places to look for new deposits. Many top notch geologists have devoted years to the specialized field of prospecting in western Quebec, within the mining belt itself and in the area in general. The government geologists, whose function it is to aid and guide the prospector, are working on two long-term programmes, first to locate the major structural breaks in the region, with a view to the discovery and development of one or more new mining camps, secondly to compile detailed information on the distribution of formations and the fracture pattern along the main belt with a view to facilitating the most economical search for the new mines needed to maintain this established producing centre.

Before leaving this western Quebec mineral field, attention should be drawn to the progress of recent years in the exploration of the area between Senneterre and Chibougamau. There are fairly clear indications of a major break running through the Bachelor Lake section. It takes time to build up the picture to the point where hypotheses become confirmed facts, but the evidence is suggestive, and moreover at least two deposits have been outlined that are now undeveloped mineral resources.

When adequate transportation facilities are available, the Dome and the O'Brien finds in Lesueur township should become mines. Further afield, in McKenzie township, the Norbeau property is also the site of a deposit, the development of which only awaits more favourable economic conditions. The completion of the road now under construction by the Department of Mines from St. Félicien to Chibougamau will reduce the handicaps to exploration and development of the mineral resources of the areas this road will serve.

Grenville Sub-Province

When we turn from the Temiscamian to the Grenville sub-province, we enter a field where the variety of useful minerals affords ample scope for the activities of the prospector-mineralogist. In addition to metals — such as the precious metal bearing lead and zinc deposits of Calumet Island and the Tetrault at Montauban-les-Mines, the molybdenite deposit at Quyon — its mineral products include industrial minerals such as feldspar, magnesite, brucite, graphite, mica, ilmenite, apatite or phosphate rock, kaolin, silica, lime, and finally stone for building and construction purposes.

Occurrences have also been noted of asbestos, beryl, copper minerals, sillimanite, magnetite, garnet, rutile, fluorite, semi-precious stones and radio-active minerals; none of these so far has proven of economic importance.

Despite the wide variety of useful mineral substances found and mined in the Grenville, the value of the mineral production of this geological sub-province is a small proportion of the total for Quebec. Small to moderate scale operations are the rule.

The great majority of the producing mines are in the western part of the Grenville sub-province, close to the centres of population. The principal reason for this is that both in the field of non-metallic or industrial minerals, and in the marketing of stone for construction or ornamentation, competition is extremely keen and prices are low. The cost of transport is therefore so important a factor that deposits in far away or inaccessible localities have received little attention.

The development of the mineral resources of the Grenville sub-province presents unusually interesting and complex problems. The prospector, who finds a deposit of gold, copper, lead, zinc or of most metals, has a mineral product for which there is a world market at prevailing prices; generally speaking the processes of separation are known; he will still have problems aplenty to solve, but the critical phase of a successful development is the discovery of the orebody. The industrial mineral field offers more scope for the imagination, and opportunities for a different approach to the development of mineral resources.

A recent example that has attracted much attention is afforded by the development of the Allard Lake ilmenite deposits. Ilmenite is an iron-titanium oxide associated with anorthosite, a highly characteristic rock type that occupies large areas in our Grenville sub-province. Within the last three years, probably the largest known deposits in the world have been blocked out on the North Shore of the St. Lawrence, 27 miles from Havre St. Pierre. Plans have been announced for their exploitation and treatment of the ore at Sorel.

Perhaps one of the most noteworthy features of this enterprise is that the principals in this development spent a good deal more in laboratory research than it cost them to locate the deposits. This laboratory research was probably the critical phase of the development, for in this case the successful and economical processing of the ore had to be discovered. The metallurgists who carried out this research were prospecting, just as truly as are the men who go into the bush with canoe and packsack to search for undeveloped mineral resources.

The Grenville sub-province, with its varied assortment of useful minerals, offers a fertile field for this approach to the development of mineral resources. The problems of processing, marketing and the economics of industrial minerals present at least as many opportunities as that of locating deposits. As examples, we might cite, research for methods of separating minerals having very nearly the same physical properties, such as the feldspars, or calcite, magnesite, dolomite and brucite; processes for the dry separation of finely pulverized materials such as silica and the iron oxides; economical methods for drying hydrous materials such as marl, peat, ochre; markets or uses for mine tailings; the extraction of potash from feldspars for use as fertilizer. These are only a few examples, and it is quite likely that the next important development will be based on a new approach to some problem that no one has even thought of yet.

Ungava Iron

Among the formations recognized in the Laurentian Plateau area, are a series of late Pre Cambrian or Proterozoic rocks, for the most part relatively unaltered, well-bedded formations of sedimentary origin. During the past few years great interest has been awakened in an area of these rocks that occupies a geological unit known as the Labrador Trough, which extends northwestwards from the headwaters of the Hamilton River to beyond the Koksoak, a length of over 300 miles; the width of this trough is about 40 miles.

Within this series of Proterozoic rocks are bands of iron formation, which, due to folding and faulting, are now repeated many times. Attention was first drawn to these in 1894 by officers of the Geological Survey of Canada. It has been common knowledge since then that the area contains immense reserves of iron formation. It is essential, however, to stress at this point that an immense reserve of iron formation does not necessarily imply a single ton of iron 'ore', i.e. of material from which iron may be profitably extracted. Iron is the fourth most abundant element in the crust of the earth, and concentrations rich enough to be termed iron-formation are common enough. Furthermore, the whole iron and steel industry is intensely competitive.

The current interest in the Labrador-Ungava district stems from the fact that an enterprising organization has located large concentrations of iron minerals, of a grade favourably comparable to ores treated in the great iron producing centres of the continent. The blocking out of 300 million tons of high grade iron deposits has been followed by announcement of plans to develop the deposits on a scale that suggests the Province of Quebec is approaching a turning point as eventful as the discovery and development of the western Quebec mining belt. This happy result is the reward of a campaign of intensive (and expensive) exploration that is unique in the mining industry of Quebec—and perhaps of Canada. Other organizations with more irons in the fire, have devoted more energy and money over periods of years to the search for new mineral deposits, but I do not know of a more intensive effort put into a single project.

As for the rest of the Shield area, the lack of available information imposes brevity in comments. Mineralization has been reported from several localities, and once again, there is no reason to doubt that this vast unexplored area has been endowed with the mineral resources favouring the establishment of major mining camps. Incidentally unless we step up the pace it will be 300 years before geological maps of the whole region are made at a scale of one inch equals one mile.

The St. Lawrence Lowlands

Turning now from our largest geological unit, the Laurentian Plateau, to the smallest,—the St. Lawrence Lowlands, we meet quite different geological conditions, and mineral resources. The lowlands occupy a triangular area between Quebec City, Ottawa, and the outlet to lac Champlain; they are bounded on the north by the Plateau, and on the south by the great Champlain fault which separates the flat lying palaeozoic beds of the lowlands from the folded formations of the Appalachian Region.

The St. Lawrence Lowlands supply the bulk of our materials of construction, that useful if unglamorous portion of our mineral production that accounts for more than one fifth of the total value; this fraction in 1948 is estimated at $33 millions. In order of relative value the principal products are cement; sand and gravel; limestone for building and construction purposes; clay products, brick and others.

These are the raw materials to the use of which engineers apply their talents the year round. Members of this Institute will hardly expect me at this time to say anything new about them. The development of these mineral resources are closely dependent upon economics and human geography. The expansion of this section of our industry will necessarily follow the demands imposed by the growth and industrialization of the Province. The deposits of suitable or usable material are widespread and abundant, but the choice of deposits of the best material that can be expected to yield products marketable at competitive prices requires careful study in each and every instance.

Appalachian Region

In the Province of Quebec, the Appalachian region lies to the southeast of a line joining the outlet to Lake Champlain and Quebec City, from whence it continues along the south shore of the St. Lawrence River and Gulf. It includes the Eastern Townships, Beauce, Temiscouata and Matapédia, and the whole of Gaspé Peninsula. It occupies about five per cent of the Province. The rock formations are palaeozoic sedimentary and volcanic beds, that have been strongly compressed to form a series of folds trending from the southwest to the northeast. Intrusive rocks occupy a small but economically important part of the region.

The Appalachian region is a mining district, and its mines have been continuously exploited since the American civil war. Until the time of development of our metal deposits in the Laurentian plateau, its asbestos mines were the mainstay of our mining industry. Today, 70 years after the discovery of the deposits, asbestos heads the list, well above any other single item in the table of our mineral production arranged according to value. The value in 1948 set a new record at over $42 millions which is 28 per cent of the total value of the mineral production of the Province.

The list of useful mineral products found in the Appalachians includes metals, gold, copper, chromite, lead, zinc; non-metallics, asbestos, talc, industrial limestone and oil; materials of construction, granite, marble, sand and gravel.

The Eastern Townships of Quebec has been termed the 'cradle of copper mining in Canada'. Since the Eustis mine at Capelton closed down in 1939 after 74 years of continuous operation, copper production has been reported from only one mine in the district; this was in 1944-45. Mineralization is widespread, and occurrences can be numbered by the tens of dozens. Most of the surface outcrops have been prospected, but there are good possibilities that improvements in technique of prospecting will lead to the discovery of new orebodies.

Near the eastern end of the Appalachian region in Holland Township, Gaspé North county, a large body of low grade copper ore has been partially outlined by diamond drilling. The owners of the property recently announced that there are 35 million tons of ore carrying 0.9 per cent of copper. Exploration is continuing and the economics of development are under study. The deposit has some features in common with the porphyry copper deposits of the Western United States, and the progress of exploration is being followed with great interest.

The lead and zinc deposits of central Gaspé, in Lemieux township, have also attracted much attention. Veins are numerous, and some of them are very large. Exploration to date suggests that there are at least 600,000 tons of possible ore, carrying about 5 per cent of zinc and one per cent of lead. Further exploration is required.

The asbestos deposits of the Appalachian region are mined at the two important producing centres of "Asbestos" and the Black Lake Thetford district. Despite the fact that the operators have successively stepped up production to attain new records for the past several years, they do not seem to have been able to keep up with the demand. In consequence, prospecting has been active, with the result that at least one new deposit of major importance has been discovered.

Summary

For 1948, the total value of the mineral production of the Province was estimated at $147 millions. Twenty-five years ago, the corresponding figure was about $20 millions. A major factor in this increase was the discovery and development of the metal mining field of western Quebec. At the same time however, great increases have been registered in the production from mining centres established at that time in the Appalachian region and the St. Lawrence Lowlands. In other words, new mineral resources have been developed both in new fields and in long established centres of mineral production.

The situation is very similar today. The programmes for the development of the iron deposits of New Quebec and the ilmenite of the north shore indicate that other mining camps are on the horizon. At the same time, new mines are being brought into production in western Quebec and another important asbestos discovery has been made.

Undeveloped mineral resources are in the ground, not above it where they can be seen. Mineral occurrences are very numerous, but mineable deposits are rare. A great deal of work must be put into a deposit before it can be considered to be a worthwhile undeveloped mineral resource and as a rule, development follows rapidly.

Prospectors, using that term in its broadest sense, should remember that the initial phase of a new mining development may be the discovery of new ore-bodies, or it may be the discovery of processes for the utilization of known but apparently worthless minerals.

The Province of Quebec produces at least fifty different mineral substances, but a very small number of these account for about 95 per cent of the total production. These are the metals, gold, copper and zinc from Western Quebec; asbestos from the Appalachian Region; and materials of construction, cement, brick, limestone and sand, mostly from the St. Lawrence Lowlands.

The remarkable expansion of the mining industry in Quebec shows that, so far at least, we have been able to locate progressively the necessary undeveloped mineral resources. 85 per cent of our territory is still virgin. Successful exploration is still underway, even in the areas close to producing mines with long histories. Plans have been announced that will bring into existence new mining camps. It seems, therefore, that we may be confident that the progress of our mining industry will remain proportional to our efforts in the search for new deposits.

EVALUATION OF SPARE AND STANDBY UTILITY CAPACITY

A paper presented to the Sarnia Branch of The Engineering Institute of Canada, on September 27, 1949

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This paper attempts to show that emphasis on continuity of utilities service has in the past caused investment of capital far beyond the margin of economic return. Today's power, steam and water services are usually purchased by industries from public utilities. But for those industries that supply themselves with these services spare capacities are rarely justified. The authors claim there is a promising field here for insurance companies, in providing coverage against risks involving loss of time and production due to utility outages and turnarounds.

Much has been written on the economics, engineering, construction, operation and other phases of our public utility systems. When it is realized that the utility demands of many industries far exceed those of their surrounding communities, it becomes obvious that the subject of industrial utility systems has not received its fair share of attention and publicity. Industry has an enormous investment in buildings, machinery and equipment, of which as little as 10 per cent, or even as much as 40 per cent, may be represented by the facilities for steam generation, power generation and distribution, water pumping, compressed air and fuel gas handling, as well as waste or sewage disposal.

Industry cannot operate without utility system functioning in an adequate and continuous manner. Often the utility investment and services are looked upon as necessary evils, and yet conversely the necessity of continuity of utility service has been emphasized to such an extent that capital is invested far beyond the margin of economic return.

The object of this paper is to study utilities from the point of view of demand, capacity installed to meet that demand, and continuity of service—with the primary end in view of keeping capital investment at a minimum while maintaining an economic operating continuity margin. Because of the authors' close association with oil refining and chemical plants, this paper may appear to be "flavoured" by utility characteristics of those industries. It is felt, however, that the ideas here expressed and methods evolved for evaluating utility capacity are applicable to all industries.

Today's Dependence on Public Utilities

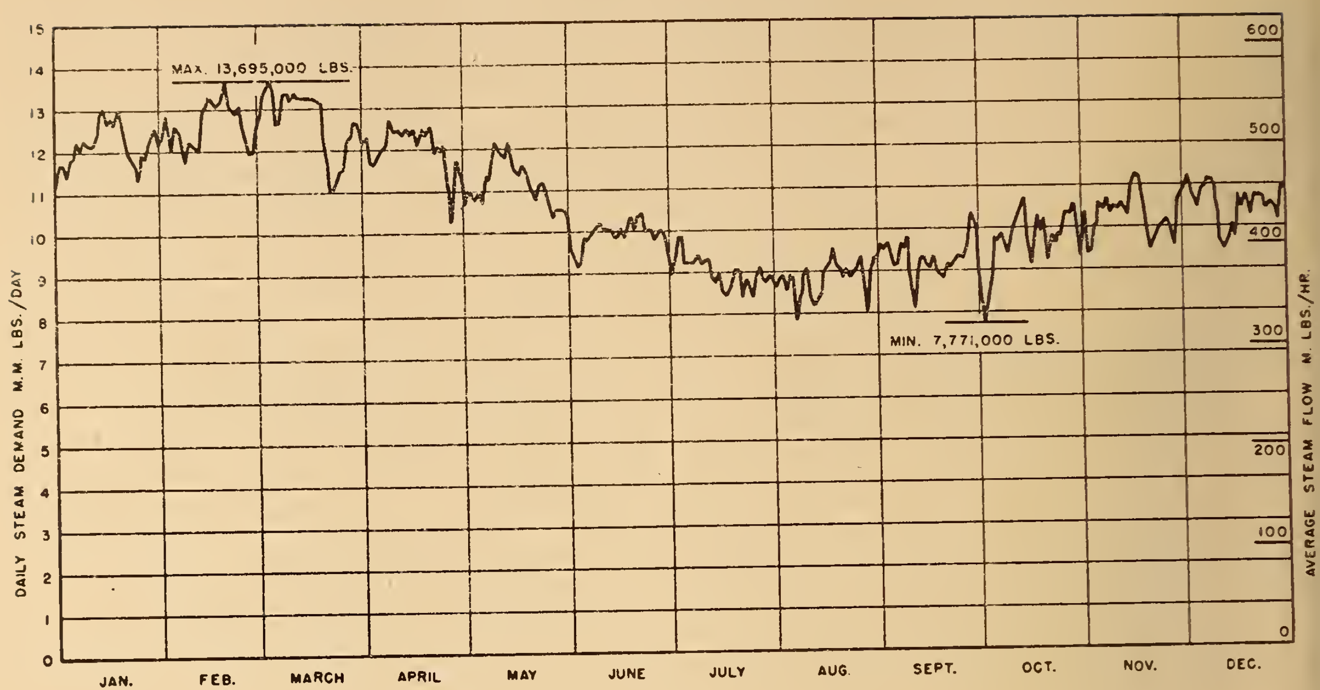
Until a score of years or so ago, owners of industrial plants preferred to undertake not only the distribution of utilities to the process units, but also generated their own steam and power, and provided all their water requirements. With the advent of comprehensive and cheap sources of power from utility companies, generation from the plants themselves became less and less common. Today insofar as power is concerned the utilities engineer is primarily concerned with efficient distribution within the plant.

This places industry, of course, in a position of complete dependence on the reliability of the public utility system, and because of this, the design of the distribution network has to take into consideration the continuity of supply to the plant. Where a decision is made to generate power the problem of spare or standby capacity will have to be considered, bearing in mind the overall station design, as well as industrial process requirements.

Steam generation is still most

FIG. 1.

— DAILY STEAM DEMAND 1948 —



commonly undertaken by each plant. There is, however, a trend today for industrial plants to draw their steam from central stations, operated by independent companies. The oil refineries in the West and South of the United States lead in this respect. They supply the fuel oil or other combustible waste products, and purchase their entire steam and power requirements. Here in Canada, a somewhat similar development took place when the large Polymer Corporation steam and power station undertook to supply steam and power to neighbouring industries. When considering the spare steam raising capacity, not only must the boiler house design be considered in relation to demand, but careful attention must also be given to the question of extra steam demand, by auxiliary steam drives provided to replace motors in case of power failure.

When considering water supply, its purpose must be borne in mind. in most cases water will be used for product processing or cooling. But fire protection is another factor which must be evaluated. Careful consideration must also be given to the requirements in case of power or steam failure, and the pumping capacity installed accordingly. In many cases water will be drawn from public utility systems, but in the case of large users, we may often find that the location of the plant was governed by availability of ample sources of water.

Spare and Standby Capacities Defined

The title of this paper suggests differentiation between spare and standby capacity. It is therefore advisable for purposes of clarity in subsequent discussion to define these two terms. If an industrial plant generates its own steam or power, or pumps its own water, a certain number of units (be it boilers, generators or pumps) will be installed to meet the plant demand for these services.

Let us take a steam generating plant as an example. Suppose the boiler house contains three boilers of equal capacity, any two of which can meet the peak steam demand of the plant. If boilers could operate indefinitely without any necessity for overhaul, and with 100 per cent reliability, there would not exist any reason for installing the third unit. Since machinery has not yet reached the status of the " one hoss shay ", it is necessary to install the third boiler for one or both of two reasons. Firstly, each boiler must be made available for regular turnarounds, and secondly it is quite possible that one of the boilers may fail unexpectedly.

To provide for the first contingency the third boiler must be installed and kept in operating condition, although it need not operate in conjunction with the other two. This is termed spare capacity. In order, however, to insure continuity of steam supply to the plant in case of unexpected boiler failure the third boiler would have to be operated continuously along with the other two units, and in that case we should have standby capacity. Assuming we would wish to provide both spare and standby capacity a fourth boiler would be required.

Power generation companies refer to standby capacity as " spinning reserve ", and its size (in one or more units) must be sufficient to compensate for the loss of the largest generating unit on the system. Industrial plants possessing both spare and standby capacity all year round are very rare. Most such plants operating on a 24-hour basis are equipped with year-round spare capacity only. However, if seasonal fluctuations occur in utility demand, the plant might have both spare and standby capacity part of the year, and only spare or standby capacity for the remaining part of the year.

Whether the third boiler in the above example is regarded as spare or standby capacity depends on the manner in which the unit is operated. If continuity of service is a primary consideration then the third boiler would be kept on the line to provide against boiler failure. In that event a further boiler would be required to provide spare capacity. If, however, continuity of services does not justify the installation of a fourth boiler, then the third boiler would be used as a "spare" boiler during turnaround periods, and as a "standby" unit while the other two boilers are operating. The same reasoning applies to all other utilities — generation of power, water pumping and so on.

If a unit after periodic scheduled overhauls could be operated without any danger of failure until its next scheduled turnaround, there would be no need for standby capacity. Only spare capacity would be required. This fact has been recognized in the British Isles to be of such importance, that a Boiler Availability Committee was appointed to study various features of boiler design and operation affecting boiler availability for service.

Spare Capacity Rarely Justified

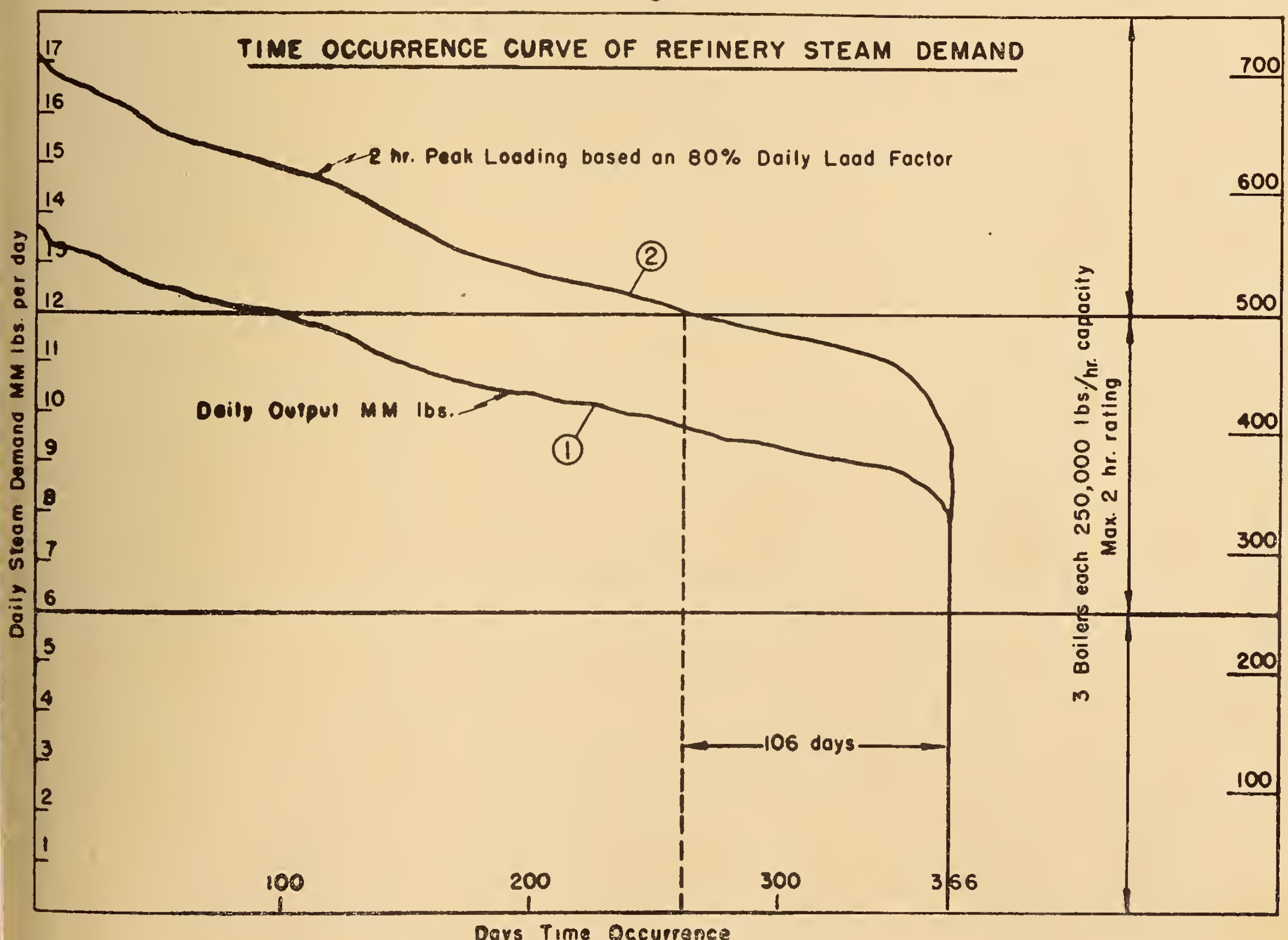
It is the writers' considered opinion that in Canada, where weather conditions have such a marked effect on steam demand in a plant, the need for even year round spare capacity is rarely justified. This statement implies of course that careful consideration is given during the planning stage to all aspects of boiler plant design, and that the boilers are erected according to best engineering practice. It is also felt that the installation of year-round standby and/or spare capacity in the water pumphouse or in an industrial power plant, could be shown to be entirely uneconomical in the light of a detailed study and design of the factory.

The requirements of a manufacturing process, and the manner in which the process is carried out, are the two major factors in determining whether spare utility capacity is or is not required. A standby unit can only be justified if the frequency and duration of utility unit failures are such that they will cause loss of production, cause damage to equipment or necessitate extensive cleanout labour. The loss involved in this compared with the initial cost of the standby unit must, however, be in accordance with the company's policy on return from investment. Suppose plant records show that utility outages will cause a net monetary loss of $10,000 per year. If the company's policy requires a two-year payout, then not more than $20,000 could be justifiably allotted to the purchase of standby equipment.

If the utility installation is equipped with spare capacity only, which after scheduled turnarounds of all units is operated as standby, the plant will lack standby capacity only during the turnaround periods. The availability of units in utility service ranges from 90 to 99 per cent, and the length of downtime may be reduced as much as 50 per cent depending on the policy of the maintenance department. If we consider a plant with four units having a 95 per cent service factor, then 73 days per year would be required for turnarounds, and the plant would thus possess standby capacity for the remaining 292 days.

It is therefore possible to reduce considerably the risks entailed in utility unit failure by intensive use of spare capacity, and also to show that the probable usefulness and justification of installing ad-

Fig. 2



ditional standby capacity to provide full protection for the entire year, is doubtful. There would appear to be a field for insurance companies to accept the risks involved in plant during utility turnarounds, probably with great advantages to both industry and the insurance companies. The foregoing discussion leads the authors to the conclusion that rarely, if ever, is both standby and spare capacity justified in an industrial utility plant.

General industrial practice requires utility unit overhauls at least once per year. This indicates that a spare unit with a capacity equal to the largest unit (if more than one is installed) is needed to allow for turnarounds. Some exception may be taken to this statement. The need for spare capacity depends on the type of production in a plant. An industry not operating on a 24-hour basis, and with week-end shutdowns perhaps, has the advantage of being able to schedule utility overhauls during the non-productive periods. Today's labour conditions make such practice expensive, but even so it is doubtful whether installation of spare capacity could be justified on the basis of maintenance labour cost alone.

The Typical Demand Pattern

When a plant operates continuously throughout the year on a 24-hour basis, then spare capacity of some form must exist in the plant to permit overhaul. Moreover, if the utility demand is steady, i.e. if the utility has a high load factor, then a spare unit is required. However, industrial plants with near 100 per cent load factors are rare. It is possible to take advantage of seasonal variations in demand and to eliminate the need for a spare unit. In designing a new plant it is essential to know the characteristic variation in demand, in order that an economical installation may be decided upon.

The following example will illustrate this point. The steam demand in a certain oil refinery is shown in Figs. 1 and 2. Fig. 1 shows daily demand plotted on a day to day basis. In Fig. 2, the demand is rearranged in order of decreasing magnitude. It appears to be characteristic of this (and other) refineries that the peak demand is in the neighbourhood of 2 to 3 times the minimum demand. It has also been found that weather has a much more pronounced effect on steam demand than on crude oil throughout.

In considering the number of units to be installed, provision must be made for a forseeable increase in future demand. Fig. 2 shows also how three units could cover the present demand as well as the future increase in load. It will be noted that the capacity of the second unit intersects the demand curve, indicating that only two boilers are needed to meet the steam demand of the refinery some 106 days per year. If these days are utilized for turnarounds on all three boilers, then the fourth unit would not be justified if only spare capacity is considered. However, there would be no provision against boiler failures in service. Moreover, the days available for turnarounds may not be consecutive, and a check must be made by reference to Fig. 1 to determine the possibility of boiler overhauls during the low-load periods.

The suggestion that spare capacity could be eliminated in the example we are considering is contingent upon two factors: first, the utility units must not fail, and second, the load demand must not be erratic, but must be sufficiently predictable to enable scheduling unit overhauls. In an industrial plant it is possible to schedule operation so that the latter requirement is satisfied. As for the reliability of the units to provide continuous service, this depends on several factors, most important of which is proper plant design and adequate preventive maintenance.

Conclusions as to Steam Capacity

The authors' conclusions concerning evaluation of spare and standby capacity can be summarized as follows:

(a) Standby unit capacity is rarely justified, except in a plant where utility failures would result in costly consequences.

(b) Year-round spare capacity is necessary for high load factor plants operating on a 24-hour basis.

(c) Where service continuity demands make standby capacity desirable, the use of spare capacity after unit overhauls as standby reduces the risk of monetary loss to the point where it could be covered by insurance.

(d) If there is sufficient variation in utility demand of a somewhat predictable nature, the year-round spare boiler can be eliminated and advantage taken of the capacity available during low demand periods.

Evaluation of Spare and Standby Water Pumping Capacity

As an example of the application of the general theory of evaluation of spare and standby utility capacity, the case of an industrial water-pumping plant will now be considered. Although the capital invested in water pumping facilities may in a given plant be lower than in its steam or power utilities, the importance of reliable water supply cannot be exaggerated. This is perhaps especially important since steam and power generation could not continue without an ensured supply of boiler feed water.

In many large installations only a small fraction of the capital invested in plant facilities is actually represented by water pumping equipment. It was probably the experience of many plant and utility engineers to hear the views expressed that 100 per cent spare capacity should be installed, since the capital so tied up would not be significant compared with the cost of the entire project. The latter fact may well be true. But to act upon it is in most cases unnecessary, and the capital represented by the difference in initial cost of 100 per cent spare capacity and the required amount may be put into much better service elsewhere.

An example will illustrate this point: In planning water service for a chemical plant the decision may have been taken that an uninterrupted supply of water shall be maintained at all times. Electrically driven pumps were installed with gasoline or steam prime movers as alternate drives, which would come into operation automatically and immediately in case of an electric power failure. To maintain continuity of production and obtain the benefits of this reliable water service, all motors in the processing units must have spare gasoline, diesel or steam drives. Unless this is the case, the process may have to be interrupted in any event on account of power failure, and the 100 per cent spare water pumping capacity would prove useless.

There is a correct size of spare water pumping capacity for a given plant. The problem lends itself to analytical treatment. The analysis will be made in a number of logical steps, the object of which is to collect all the relevant facts and data.

Fire Protection

Water will be required in case of fire. We must, therefore, analyse the fire fighting programme in our plant and obtain information on the amounts of water required. Unless the plant is heavily concentrated or small, it would scarcely be necessary to make provisions for a fire embracing the entire plant. In such a case our water pumping station may be put out of order as well, so that provisions made for such a contingency are simply illogical. Wise management and careful accident prevention policy would eliminate all but the smallest fires. Yet occasionally we may be faced with a more serious contingency for which preparation may be necessary. In all probability it will be possible to divide the plant into several zones, and firefighting equipment as well as water provisions will be made on the basis that only one zone would be endangered at a given time.

Having evaluated the water requirements we must turn to deciding on the spare pumping capacity. (Standby capacity to meet a fire emergency is of course unnecessary, since by the time the fire service is at hand to combat the danger the spare pumping unit, if necessary, could be brought into operation.) In chemical plants it will probably be found that the amount of spare capacity for fire service water is smaller than determined by other considerations.

The problem of a fire inside the pumphouse itself must not be overlooked. On the whole such fires are not serious. In most cases it will probably be a question of some electrical fault on the switchboard, a burnt-out motor, or perhaps a fire in a fuel tank in the case of gasoline or diesel driven pumps. Under normal conditions such fires can be localized and efficiently dealt with, so that no protection against such emergencies, except of course efficient fire fighting equipment, is necessary.

Interruptions

Our next step is to evaluate the maximum time for which the normal water supply to the plant for process work could be interrupted. An analysis of every unit should be made and a tabulation computed to show how long normal production could proceed on each unit without water. Depending on the nature of the process and design of the units, it will probably be found that in some cases continuous water service must be maintained because of damage to the unit. Other units may be able to carry on normally for a few minutes or even several hours (e.g. a boiler plant with a water storage tank). Where severe damage to the processing plant will immediately result from water failure, sufficient standby capacity is recommended, since in all probability the cost of repairs and production loss while the unit is not in operation, would justify the capital invested in protection against such an emergency.

The third stage is to assess the cost of process interruption. Where the nature of the process is such that it can be stopped and restarted at a moment's notice, data should be computed showing such costs per hour-stoppage. In many cases, however, especially in chemical plants minimum shutdown times may be necessary, requiring rerunning the product, cleaning the equipment and so on. In such cases data should be obtained showing the fixed cost of a shut-down plus the hourly loss of production.

Considerable discussion would probably result in any attempt to arrive at the cost of such losses. In a case where the production schedule is such that lost time can be made up, and no loss of sales would result, the plant shall be considered as having sustained no loss, unless manpower was actually diverted from other operations to help clean up the equipment, process material was wasted or overtime was worked. On the other hand if loss of revenue should result the net profit (i.e. after corporation taxes, etc.) should be charged.

The question which we must pose now is: How reliable is our water service, and what type and duration of outages must we expect? Most likely pumps will be electrically driven, and in that case the problem resolves itself at once into an analysis of reliability of the electrical power supply.

If power is generated in the plant, all that is necessary is to examine the standby or spare capacity in the power house and estimate on that basis what interruptions are likely. If a decision was taken at the time of overall planning not to provide against generator failures but rather to curtail production, then the same will apply to our pumping problem; viz. no spare capacity is needed on this account.

It is possible of course that although no spare generating capacity exists, the drives on the process units have spare steam turbines or engines to provide against electrical outages. In that event production would go on and water must be supplied. A survey should therefore be made of all those units which are independent of electric power supply, and sufficient spare water capacity will have to be installed to meet the demand of those units.

Outages due to that proportion of the distribution network feeding the water pumping plant are generally not frequent enough to warrant installation of spare capacity with alternate drives. However, where for some reason failures of power feeders are common, there would appear to be a good reason for improving service continuity in this respect, rather than making expenditures to provide alternately driven spare capacity units.

Utility Outages

More likely than not, power would be purchased from a public utility corporation. In that event a visit to the suppliers substation feeding the plant will readily supply the answer to the question of reliability of this source of power. If the substation has been in operation for some time, its records over the past few years will be invaluable. If it is new, a survey of its equipment, loading and interconnection will have to be made. It should also be borne in mind that public utilities are aware of the demand placed upon them by the consumers as regards continuity of supply, and in all probability plans were made to meet the plant demands in a reliable manner. However, even in most up-to-date substations outages will occur, and these may be classified as follows:-

(a) Pre-arranged outages, to enable work to be carried out on equipment in the substation or on feeders leading to the plant.

(b) System disturbances due to lightning on the transmission lines, surges or overloads.

(c) Outages due to erroneous switching.

(d) Direct lightning strokes on the substation.

In the case of prearranged outages, sufficient warning will have been given to the plant to close down or curtail its operations, so that no damage to equipment of any kind is likely. Thus the only loss that the plant is likely to suffer is one of production. It is doubtful, however, whether such outages would be frequent enough to warrant installation of spare capacity.

The frequency of outages due to system disturbances can be readily ascertained from the substations records, or in the case of a new substation they can be estimated. If the substation is supplied with only one line from the power source, the system would, indeed, be vulnerable. On the other hand a duplicate line routed through another area would probably eliminate all but a few outages each year of very short duration,—a few minutes in most cases. (Sometimes the outage may last even less than a second, and in such cases time delay relays on motors would prevent an interruption altogether.) Thus having arrived at the likely duration of outages we can estimate how soon the pump motors can be back in service. We estimated previously water requirements of all our process units and we can now compare those with our outage figures. If normal production can continue for the duration of these outages—no spare capacity is needed.

If there should be a case where heavy damage to equipment can result in the event of a sudden outage, that unit must be protected, and sufficient standby capacity must be installed to meet that units demand. In case no damage is likely but production must cease, an estimate of likely losses should be made and economics of installing spare capacity analysed on this basis. It is of course unnecessary to mention that the problem should not be even considered unless alternate drives are provided on the process units which could operate in case of electric outages, or unless it is a case where the process itself is independent of electric power.

Direct lightning strokes are infrequent. When met with they may cause damage which may take several hours or perhaps even longer to repair. The case should, of course be considered, but there is considerable doubt whether the frequency of such emergencies would justify any spare capacity, except of course to prevent damage to equipment. Motor and pump failures are to be expected. Installation of spare capacity on this account should be considered in relation to expected frequency of failures and likely monetary loss.

It may well be that the water pumps are steam driven, or other types of prime movers are used. A procedure analogous to that described above will have to be applied. In the case of steam drives an analysis of boiler house reliability will provide the answer. In case of diesel drives, which are independent of energy transmission from central stations, only a spare unit to cover maintenance should be considered. This should not be interpreted as implying that an additional unit should be installed.

Adequate inspection and routine maintenance can insure continuous service when the unit is necessary, and a decision on this question should be made by analysing our annual water demand curve. We may well find out from this that there is sufficient time during which the plant demand is sufficiently low to enable regular maintenance. Only if our demand is of such a nature that there would not be adequate opportunity for overhauls, should an additional unit (or more if necessary) be purchased.

Summing Up

Our next, and final step, is to summarize our findings.

Let our water requirements in case of fire equal F gals./min.

Let our minimum spare capacity required in case of a power outage equal P gals./min.

Let the size of our largest unit (if it is electrically driven) equal L gals./min.

If other-than-electric drives are provided for normal operation of the pumps, L shall denote the size of the unit, or units, which must be installed to enable adequate maintenance.

The three values: F, P and L are now compared and the greatest should be chosen as the correct size of the spare unit.

Exception might be taken to the last statement, for obviously there would be inadequate provision for a combined fire emergency and a power outage. Such contingencies might conceivably exist, as for instance when a power failure causes a fire, or vice versa when cables are damaged as a result of fire. In that event spare capacity equal to $F + P$ or $F + L$ must be provided, but before actually installing such capacity careful consideration should be given to the layout of the electrical network and to assessing the real danger and possibility of such an emergency.

It may be found that re-routing of the main feeders to the water pump-house or other precautions may reasonably remove the possibility of such a contingency, and thus obviate the necessity for protection on this account.

Having determined the spare or standby capacity requirements, the routing of this water must seriously considered to make sure that it serves the purpose for which the installation of spare or standby capacity was justified.

THE ENGINEER IN THE DAYS AHEAD

An address given at a dinner of the Engineering Alumni Association, University of Toronto, September 30, 1949

by

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It is perhaps not unfitting that on this occasion I should, along with you, speculate a little on where the engineer appears to be going, and say something too in justification of whatever educational faith has grown up in me over the years. While I now speak as one not having authority, and perhaps not unlike a scribe, I trust that the freedom and irresponsibility so recently gained may not lead me into any suggestion of specific educational policies. That is the business of others.

Any examination of educational philosophy or practices would be pointless without establishing at the outset some concept of the kind of academic product that is desired.

That is by no means a simple matter. Opinions on the subject as widely divergent as the poles are to be found amongst employers. Small, tentative enterprises frequently offer only seasonal or "by the job" employment, and this only to men who are long on practical techniques and frequently short on theory. This practice was characteristic of most of the engineering employment fifty years ago. Today, most of the efficient and enduring corporations are closely on the watch for young men who, perhaps with little experience, have good ability, sound educational preparation, attractive personalities and the capacity to secure the ready and cordial co-operation of those with whom they are associated. Such employers are ready to provide in-service training by which the special methods and practices peculiar to the industry may be demonstrated to the novice. The engineering schools have been heartened by evidence that more and more employers are becoming interested in such long-range plans, for under them the young engineer can best establish his worth to the employer and to the country.

The public, quite as much as the employer, has an interest in the matter. That concern is not in respect of technical competency, for the licensing bodies attend to that. Are the young men, it asks, who have had an expensive education, half of which is paid for by governments or benefactors, coming out of the engineering schools with a resolute determination to make the country a better place in which to live? Are they doing as much as members of other professions and educated callings to enhance citizenship and make fast the moorings of our democracy, or do they regard themselves as in a preferred class that takes much and gives little? Are they, by any chance, open to the old banter about the fault of the Dutch being given too little and asking too much?

In any effort to outline the essential qualities of the engineer of the future, it is useful to indulge in a little retrospect. What is the engineer of the past like, how well did he get on, and what is it that has brought him along thus far?

> Potiphar Gubbins, C.E.
> Stands at the top of the tree,
> And I muse in my bed
> On the reasons that led
> To the hoisting of Potiphar G.*

A century ago there were at most a hundred qualified civilian engineers in Canada to serve a population of 2,500,000. Today, there are about 25,000 in an expanded country of 13,500,000 people. While in the interval the population has multiplied 5.4 times, the number of engineers has increased 250 times, or nearly 50 times as fast as the population has grown. In that simple fact is found clear evidence of a mounting conviction on the part of the general public that the engineer has worth and that his works are greatly to be desired.

By the opening of the present century, popular knowledge and appreciation of the work of the engineer had greatly increased, particularly by reason of his achievements as a builder of works associated with transportation—canals, railways, harbours—and with the development of our primary natural resources. It was the era of the surveyor, the civil engineer, and the mining engineer. The great upsurge in the application of hydro-electric power to the needs of man had not come, and

* From "Study of an Elevation in Indian Ink", "Barrackroom Ballads" of Rudyard Kipling. By permission of A. P. Watt, London, England.

Canada was as yet but slightly industrialized.

Still all was not well with the engineer of fifty years ago. Writing a short time previously, Alan Macdougall, one of the honoured founders of the Engineering Institute of Canada, had accepted for Canada the view of the president of the Western Society of Engineers that,

> "The early engineer of this country was a species of scientific or skilled tramp, with a precarious tenure of position measured by the work in progress. He furnished his employer with the skill of his trade without questioning public policy or the best solution."

On his own part Mr. Macdougall observed that,

> "There is about as much wire-pulling and log-rolling amongst engineers as amongst the vendors of patent articles; corporations all know it and make full use of it; they either make engineers bid directly against each other, getting advice for nothing through the public press, or set them to work directly or indirectly to cut down each other's fees. As the profession stands today, it is almost a trade."

Since that memorable paper was written the status of the engineer in Canada has notably improved. The provincial associations of professional engineers and the many voluntary societies are entitled to a generous share of the credit for the change. But even more telling in the evolution has been the extensive industrialization of the country during the last 35 years and especially during the past ten. That has opened up innumerable new fields of continuing usefulness for the engineer. Large working forces are employed in urban centres on stable enterprises, as contrasted with the intermittent engagement of relatively small numbers in dispersed groups on far-off physical frontiers where the primary resources lie. One needs only to remember that perhaps 75 per cent of all present employment in this country is associated with products and services that were unknown a generation ago to appreciate the significance of the engineer's activities. The attritions that have been associated with the organized labour movement have no doubt thrown into relief the intimate and manifold interlocking of those activities with the community and national life.

And now, what of the engineer of the future? To what degree will he be able to consolidate the gains that have been made by those of his calling who have laboured before him, and pass on to new triumphs and enlarged public usefulness?

In my view the engineer of the future will need to be even more thoroughly grounded in fundamental science than his predecessors. The day of the empiricist in all but routine tasks is past. Rapidly increasing complexity of machines, apparatus, and processes created to function in accordance with newly formulated scientific principles renders it necessary for the engineer in any developmental project to become, in effect, a scientist-engineer. More and more will he acquire the research spirit and so narrow the gap that has existed between him and the scientist. The association will be a fruitful one for the worker in pure science, since it will assuredly reduce the lag between discovery and utilization.

With the passing years increasing numbers of engineers have demonstrated marked fitness for directional or administrative work. A day or two ago I recalled in a few moments the names of fifty of my own engineer acquaintances who occupy posts as presidents, vice-presidents, general managers, or otherwise-titled directing heads of very important enterprises in this country. I recognize many here tonight who are in that category.

The reasons for the engineer's ascendancy in this field all stem from his habit of dealing honestly and expeditiously with the facts as he finds them, whether they concern machines, materials, or men. But important adjustments need to be made and are made by engineers who pass over from a technological career to executive work. An eminent Canadian engineer whose time is now spent largely in directional work portrays the necessary transition thus:

> "Moreover he must discard, in his administrative position, some of the qualities which have brought him success. He must learn to ignore the details in order to liberate and broaden his vision. He must abandon the habit of looking for defects, a very useful habit for the young engineer, and replace it instead by the faculty of finding and developing the qualities of the men around him. And lastly, in this second phase of his career, the engineer who had previously been in competition with other engineers, must now make good against men of entirely different formation, lawyers, accountants, bankers and business men."

I believe that the engineer of the future will be notably community-conscious. Any one who has a stake in an enterprise employing many persons in these days is acutely aware of the need of it. Movements in the direction of greater solicitude for workers at all levels, partly stemming from the representations of organized labour, and partly from corporate self interest, have brought about a re-examination of our attitude toward the society in which we live. The service of engineers on public and welfare bodies, now by no means uncommon, will markedly increase, for one whose undertakings depend for execution on the co-operative efforts of many individuals is especially likely to be sensitive to influences that make for stability and contentment. Moreover, the survival of our modern democratic institutions will have to be assured by active workers, for the duties of citizenship cannot be delegated to a non-existent leisured class. The disciplined mind and the moral energy of the engineer will bring a powerful force to bear on the solution of baffling public problems.

It is to be expected, too, that as the interests and responsibilities of the engineer widen he will become more acutely aware of the wholesome satisfactions that come from some degree of participation in, or active support of, the arts, music, literature, the drama, and the sciences that are unconnected with his professional needs. Recent art exhibitions for engineers have revealed an amazing degree of participation. One of the members of the Royal Commission on the Arts and Sciences is a distinguished engineer.

For a well-trained and broadly-cultivated engineer the future holds promise of high technical achievement and of attainment in some measure of what William James calls "that rarest form of virtue — civic virtue." New products, new machines, new processes, and entire new industries will make for greater wealth and greater security. It is inconceivable that venturing mankind will recoil in the face of such opportunity. Engineers and industrialists have not lacked courage or enterprise in the past and are not likely to be short of it in the future.

Role of the Professional Schools

Upon the professional schools of engineering rests the obligation of providing the formal educational preparation of the young men who will become the engineers of the sort that the future demands. Not all graduates will attain top ranking posts, for the distribution of technically trained persons amongst positions of varying responsibility is not sensibly different from the distribution of any other type of educated workers. Very many are needed to serve in intermediate capacities. The time has long since passed when a few uneducated geniuses, such as James Brindley, or George Stephenson, could, with the aid of mechanics and labourers, attend to the technological needs of their times. Nowadays, the hands of the masters are strengthened by thousands of trained professional or sub-professional assistants who are competent to conduct planned scientific or technical procedures in conformity with ascertained natural law for the realization of a desired objective. Science makes possible a vast extension of the personal powers of the chief.

What type of professional school is best suited to provide the engineer of the future, of whom I have spoken? I do not know of a better specification than that formulated by William Barton Rogers, the founder of the Massachusetts Institute of Technology, that is

> " . . . one founded on a thorough knowledge of scientific laws and principles and which unites with habits of close observation and exact reasoning a large general cultivation."

The achievements and prestige of the great institution to which these principles were applied afford a striking verification of their soundness.

Perhaps the educational principle upon which the professional schools of engineering now most generally agree is that undergraduate training should be concentrated heavily on the fundamentals. With these the engineer of the future must be thoroughly familiar, for they constitute the chart and compass by which he will be enabled to navigate the treacherous technical seas before him. Mastery of all the facts, even in a comparatively narrow specialty, is impossible. Even if it were possible, many of them would be outdated before action based upon them could be taken. For these reasons education, if it is to be effective, must become more reflective and less acquisitive. Only by speculation and analysis will the young engineer discover those continuities and linkages that unite an apparently disordered mass of material.

And so theory, that thin streak of light that leads the scientist and the engineer through complicated mazes of fact, enables them to find their way to understanding and original creation. Revolutionary advances nearly always come from those who have the most thorough comprehension of the scientific fundamentals. The superiority of the scientist-engineer Elihu Thomson as a discoverer, thinking his way carefully through to sound theoretical ground and practical solutions that almost never failed, over Thomas A. Edison, the empiricist, plunging impetuously ahead in the monumental process of elimination, with a staggering score of misses as well as hits, is obvious. It was James Clerk Maxwell, the mathematical physicist, who by his classical theory of electromagnetism, really created the present electrical age. Nuclear fission, with all its challenging problems of utilization, rests on the theoretical work of Rutherford, Moseley, Bohr, Chadwick, Hahn, Strassmann, and Meitner.

The common device of selecting and adhering closely to a specialty is not a general remedy for meeting the overabundance of scientific fact and theory. A student may find personal satisfaction in the sense of mastery gained by limiting his field, but it unfits him for dealing with situations which can be resolved only by the application of principles indigenous to several sciences. Moreover, as has often been pointed out, many graduates do not find their life's work within the bounds of the specialty with which they concerned themselves at college. On the other hand, the educational importance of motivation is not to be overlooked. Limited options or electives may secure this and at the same time give some training in the method of intensive exploration of a particular topic.

From the national point of view a still more serious aspect of the matter of specialization is the threatened bankruptcy of society that would inevitably flow from the absorption of all the brilliant intellects in high specialties, leaving to mediocrity the task of running the country. Government, or the direction of large enterprises of any kind, hazards, and threats that can be made only by one whose view is broad, whose knowledge is general, and whose sympathies are catholic.

The need for more and more engineers who are competent to grapple with the complexities of modern technical situations and find their way through to daylight beyond suggests the desirability of increased rigor of selection of candidates for professional training. A larger proportion of engineering students must be capable of taking work at the graduate level in the field of the scientist-engineer. Priceless are those who, with simplicity of means and an analytical power born of genius, can resolve confusions by quickly apprehending the principle about which they cluster. Michael Faraday made revolutionary discoveries with the aid of common kitchen utensils. Charles F. Kettering, with characteristic over-simplification, once said that the only apparatus a scientific school really needed was a ball on the end of a string.

However preoccupied the professional schools may become with immediate educational tasks, there rests upon them the over-riding obligation of frequent re-examination of their philosophy of education. Is the effort merely to equip young men to perform certain scientific or technological duties superlatively well? If that is all, we might well set ourselves to the devising of machines that will do it quicker and with complete accuracy. Electronic computers are displacing armies of plodding human ones and may do more.

But there are tasks that no mechanism, however perfect, and no mechanistic thinking, can compass. The right to live our lives in our own way is being ruthlessly challenged. The threat, portentous in all its aspects, is not one that can be met by technology alone. It is a matter of dealing with unprecedented human obliquity, and it is on human agencies that we

(Continued on page 752)

DISCUSSION

Mechanization of Pulpwood Logging

G. E. Lamothe, M.E.I.C.[1]

It is with great interest that I have read Mr. O'Halloran's paper in the September, 1949 issue of the Journal, and for two reasons:

(1) Price Brothers & Company Limited, with whom I am connected, have, since 1927, been slowly feeling their way along the Mechanization trail and I have been in close contact with these trails.

(2) I give lectures at the Laval University Forestry School on the matter.

As Mr. O'Halloran states, the problem is an intricate one with many angles and variables. There are many schools of thought. However, some ideas are beginning to crystalize and Mr. O'Halloran points out that we in the East realize now that we must work out our own techniques and design our own machinery, and that we cannot copy the West Coast loggers.

It is my considered opinion that our bush labour has not deteriorated greatly throughout the last decade. In many districts, felling per man-day, for instance, generally the largest single item in logging pulpwood, is roughly the same, as far as volume is concerned, as it was 10 and more years ago. The training of these choppers is, no doubt, responsible for part of this.

However, the man-days per cord for delivered wood have increased. There are many reasons for this, the principal being the creature comforts offered to our men as compared to 10 years or more ago. We now have larger, better, and cleaner camps with car roads to each camp. Another factor is that we are all now logging farther from our mills than we did 10 years ago, with all that this means.

Boiling down the matter to its simplest expression, very few people are delivering their wood mechanically to river bank today at less expense in man-days or in money per unit than they are by the conventional hand labour pieceworker method. It is admitted, however, that engineering principles have helped logging considerably, especially as regards road building and river improvements. The very fine flume and loading plant at Forestville, as described by Mr. O'Halloran, are proofs of this.

Logging costs today by conventional labour methods are probably around 90 per cent for labour, and we have to beat this with mechanization. Piece work is the basis of this conventional method; our labour is accustomed to this method and likes it.

Countries which have been in the pulp and paper business longer than Canada still use piecework methods probably more than we do—for example, Sweden and Finland, our biggest competitors. No mechanization to speak of is practised there, except perhaps in river driving.

The question now arises whether we should go in for mechanization along so-called mass production lines where piecework is more difficult to apply; or should we have piecework as the basis of our mechanization?

At the present time the average age of our loggers is less than 30 years—probably around 25 years. If we could increase this average age, and therefore get men who would make logging their life calling, we would be getting at one of the targets Mr. O'Halloran has set for mechanization: that is, highly trained men and hence better paid men with, of course, higher production.

In a problem such as this, one has to face facts. Our labourers, 85% of which probably come from the rural districts, are being told by strong forces that their salvation is on the land and that logging is seasonable and temporary. This does not fit in with better trained and specialized labour, or with an increase in the average age.

Having this in mind, should we not aim at a mechanization that will fit into this pattern for the present at least? It is again my considered opinion that, to fit into this pattern, our present-day mechanization must be based on piecework. If this is so, based on the present average of our workmen, the machinery must be simple. The mechanical saw, the very simple light and small yarding unit, the simple vehicle where very small crews can operate, seem to meet this requirement. When I mention this small crew, I mean one that is not entirely dependent on the machine, and has a cushion to fall back on if its machine fails.

Although it would be perfection to run a logging operation on an assembly-line basis, logging, due to climatic conditions, restless labour, topography, type of soil, stands, size of trees, etc., (Mr. O'Halloran has named them all) suffers from many hold-ups. If one mechanical break-down holds up the work, the lost time is multiplied by the number of men employed at it.

If the crew is small, the hold-up is proportionate. If the pieceworker can continue to do something if his machine should break down, this loss of time is still minimized. For example: The mechanical saw operator, if his saw breaks down, can fall back on his bucksaw. The small crew of a few men — one tree-felling, the others skidding or bucking—using the small skidder, all on piecework, can always fell trees as a cushion till they get their machine repaired.

If this is the solution, and those concerned having the same type of forest can agree with this view, the machinery end of the problem would be greatly simplified and manufacturers would know what to do. At present they are in a quandary, trying to fit West Coast logging equipment to our very different forests.

Mr. O'Halloran's suggestion on the training required by the engineer who is to plan mechanization might indicate that he has the same idea in mind—to get people thinking alike.

On this matter of training in Sweden and Finland, all the river improvements and mechanization of the sorting booms are directed by Civil Engineers. What I have seen of these operations would indicate to me that they are more advanced than we are, as few Civil Engineers are used in this country for this type of work.

In road work, for instance, the Civil Engineer must know the application of machinery and not necessarily its design, although he can give good data on what is required. I believe the same applies to logging. For the young man who is starting out, and whose experience, as he acquires it and not his

[1] Chief logging engineer, Price Brothers and Company Limited, Quebec, Que.

education, will make him a specialist, it is my opinion that a good sound general engineering education, is the best tool he can have to start in this type of work. Some of the universities are realizing this and are giving, especially in Forestry Schools, some engineering. I doubt, however, if any Engineering Schools are giving lectures in Forestry.

It is a pity because, up to the present, Civil Engineers have fitted well into this work, with their hydraulics for river driving, flumes, booms, and dam design; their soil mechanics for dams on poor foundations and road work. Their knowledge of this latter science and the application of certain machinery to this work which is also applicable to logging—e.g. trucks, tractors and skidders, the latter being fundamentally a drag line, as Mr. OH'alloran has told us—are all tools of the Civil Engineer.

Mr. O'Halloran and his Company, the Anglo-Canadian Pulp and Paper Mills Limited, deserve much credit for the pioneer work they have done in pulpwood mechanization, and I feel sure that we owe them a great debt.

J. O'Halloran, M.E.I.C.[2]

It was interesting to read the discussion by Mr. G. E. Lamothe of my article on Mechanization of Pulpwood Logging as he is recognized as being one of the leading authorities on this subject. His comments were greatly appreciated and indicated that he has given a great deal of thought to this subject.

I would like to mention in connection with my article, that it was completed a short time before we came to the decision that a Modified High Lead Yarding system was not universally applicable to our type of timber limit. We have therefore greatly curtailed that part of our mechanization development, although we are continuing experimental work with other ideas which may be more suitable for our type of terrain and stand of timber. Valuable information has been obtained by the work which has been done along the lines of establishing limitations of certain types of equipment for this work.

Generally speaking, it would seem to me at the present time, that there is more chance of complete success in mechanization with small portable units on a piecework basis, as described by Mr. Lamothe, than with the large massive units with which we have experimented.

[2] Chief engineer, Anglo-Canadian Pulp and Paper Mills Limited, Quebec, Que.

DISCUSSION

Precipitation-Evaporation Relationship on the Canadian Prairie

In the October issue of the Journal, *in the "Correspondence" Section on page 671, there appeared a letter from Floyd K. Beach, M.E.I.C., discussing P. C. Perry's paper "Precipitation-Evaporation Relationship for the Canadian Prairie" which appeared in the August* Journal. *Further discussion has taken place and is reproduced below.—Ed.*

P. C. Perry, M.E.I.C.[1]

Mr. Beach's remarks are extremely interesting and will make a valued addition to the notes gathered on the subject.

As Mr. Beach suggests, I have not attempted any accurate determination of surface evaporation losses or the relationship of such losses to conditions in the adjoining air. Probably it would be feasible to set up fairly accurate relationship between evaporation from open water surfaces and known or measureable air conditions surrounding. Close relationship could be established between certain types of cultivated fields, as long as surface conditions remain constant. To determine evaporation losses from a given area such relationships would have to be established for every type of surface included, and the area of each type would have to be known. In a large area the percentage of different surface types would change from year to year; and in the author's opinion accurate determination is not feasible.

My estimates were made after study of measurements of evaporation available, also stream flow behaviour in relationship to precipitation. It would appear that the total average evaporation from large areas varies quite closely with mean annual temperatures, and an attempt has been made to fix the approximate relationship.

It is believed that a general understanding of the basic principles involved is more important than mathematically correct evaporation measurements. That is, we should recognize that we have a large area of moisture deficiency, of varying intensity. This deficiency is not due to loss by run off as some suggest, is not due to seepage loss; but due to the fact that normal evaporation needs are greater than average precipitation.

Mr. Beach's reference to effect of tree shelter belt on rate of evaporation is extremely interesting and touches a field where considerable difference of opinion exists. The reduction in evaporation from soil and water surface through shading and reduction of wind velocity is certain, but on the other hand the trees draw large quantities of water from the soil and yield to the atmosphere in the process of transpiration. Some writers refer to this process as one of the valuable contributions made by trees. The difficult thing to agree on, is the *net* effect; but the author is convinced that, for the type of tree growth, and other conditions prevailing on, or near, the Canadian Prairie, that the net result of tree growth is to reduce loss of moisure to the atmosphere. That is, the presence of trees tends to increase the free water available from precipitation (surface water, ground water or both).

The question of permanent or progressive climatic change for the Prairie area is a subject requiring much more space than should be taken here. Briefly, the author's conclusion is that there is little change as result of human activities, this being confined to slightly increased evaporation, (for same meteorological conditions) due to clearing and cultivation of soil. The trend towards slightly higher temperatures must be recognized for the period of record, but we do not know whether this will continue indefinitely or form part of a cycle with reverse tendencies coming in future. As to regular cycles it is felt that the information now available indicates that no dependable cycle has been determined.

[1] District engineer, Saskatchewan District, Western Region, Canadian National Railways, Saskatoon.

Floyd K. Beach, M.E.I.C.[2]

Mr. Perry's paper is on a subject so vitally important to prairie dwellers that I was anxious to see enough discussion to call attention to its content.

Let us hope that we shall not be driven from this land by soil drifting and general desert conditions. We have been close to it in some years and the danger is ever present. Man can govern evaporation from the land he tills to some slight extent. The actual amount of moisture which he conserves may be small, but if it enables grain to take root the slight amount conserved turns the tide for another year.

Just how the conservation of moisture is effected will vary with locality and the individual farmer. Trees will die if the moisture deficiency becomes too great. If they live, some varieties spread roots over too great an area and rob other crops of needed moisture. If any kind of tree lives, no crop grows under it, nor for a certain distance from it, but yields within a windbreak may exceed yields where there is no windbreak. Strip farming is the answer in some localities, and there are probably special techniques practised by individuals that help turn the tide of excessive evaporation.

Meanwhile, run off from mountain streams—source of irrigation water—is decreasing. Glaciers are receding. Temperature on the prairies increases with resulting increase in evaporation. It takes determination and intelligence in those who till the soil to be successful in agriculture against these odds.

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[2] The Petroleum and Natural Gas Conservation Board, Province of Alberta, Calgary.

THE ENGINEER IN THE DAYS AHEAD

(*Continued from page 749*)

must depend for remedy. The intelligent, resolute, and continuous effort of every citizen, not excluding the engineer, will be needed. Without it, the days of the democracies would be numbered and no engineer could look forward to any freedom of action either professional or private.

It would be regrettable if any young men should leave the professional schools of engineering without having given a moment's consideration to the political, economic, social, and philosophical questions about which the world of today is in something approaching mortal conflict. Lacking some introduction to these areas of thought, they would be thrust into a world of strife in the garb of illiterates in all that pertains to a desperate human struggle the end of which is not in sight.

There is another reason why the engineering schools should give some attention to these matters. By reason of the popularity of the science courses, the numbers of graduates in applied science and engineering are increasing much more rapidly than are those in arts. Between 1931 and 1945 the graduates in applied science and engineering from Canadian universities increased by 81 per cent. In the same period the graduates in arts, including those in the science courses, increased by only 23 per cent. The political, economic, and social fields, long thought to be the particular territory of the arts graduate, will need to be entered in some measure by graduates in applied science and engineering if the universities are to maintain their contribution to public discussion and service.

Accepting what they believe to be a public responsibility many of the leading engineering schools of this continent have undertaken to develop in undergraduates some appreciation of the economic and social currents of our time and a capacity to think and act intelligently in situations that affect our lives as citizens. Some college heads, notably the late President W. E. Wickenden, of the Case Institute of Technology, have held that general educational preparation for life in its varied aspects might well be found in the schools of engineering. Those of our graduates who now labour in fields that are in no way associated with engineering will, I believe, generally support that contention.

In the advocacy of these views I have been strengthened by a passage in the memorable inaugural address of James R. Killian, the tenth president of the Massachusetts Institute of Technology, having particular reference to the philosophy of the founder, William Barton Rogers. Said President Killian:

> "In the second half of the twentieth century the need for the 'large general cultivation' of which Rogers spoke will have a commanding urgency. No college, in a world of turmoil, can shirk the responsibility of preparing a man to be a citizen as well as to make a living. As we stand at the mid-century point the responsibilities of the professional men, especially the scientists and the engineers, have a new and awesome measure."

Notes on Management

Combination for Industrial Relations Studies

The most important function of management, the one that has more to do than any other with the success or failure of the enterprise, is that of inspiring the organization with enthusiasm for results. Since that accomplishment demands a broad comprehension of the general field of industrial relations, it was an interesting event for the Montreal Branch of the Institute to hear something recently concerning the aims and organization of the McGill University Industrial Centre from its director, Professor H. D. Woods. Some of his remarks, in condensed form, are offered below.

In our system, the working force, and all those who in any way contribute effort or capital or resources to the productive process, are contributing to material welfare only as incidental to their own interest. In other words, there is no basic harmony inherent in the structure even though harmony is vital to efficiency. We have not found any means of working out a satisfactory division of the product of industry among the various claimants. Who can establish what the basic wage should be, or the wage for the different classes of skilled workers, or the salaries of executives, or the rate of interest or of profit? This suggests the economic aspect of industrial relations.

Modern business involves division of labour and responsibilities and therefore a need for co-ordination. Co-ordination implies supervision, and supervision means that one personality is subjected to the direction and control of another. Both parties are human and each party manifests attitudes and modes of behaviour which relate to his psychological endowments, his environment, and his experience. Here we have the basis of the problem of supervision.

No two persons are identical in terms of their potential contribution to industry. Occupations and functions also differ. To some extent, it is possible to match personal characters to the qualities and qualifications required in particular occupations. Conversely, within limits, it is possible to alter job content to meet personality needs. These points indicate the problems of selection and of job analysis.

Aside from the question of supervision, modern industry requires men to work in close association with other men and this also calls for an adjustment to a human situation. Furthermore, people in functional groups may develop a group identity. Such conscious groups may be an effective stimulus to efficiency or they may set up serious resistances. It is from these situations involving supervision and personal human relations that worker grievances emerge, and it is this area which provides trade unionism with its second important function. Trade unionism, through collective bargaining, attempts to establish a system of internal industrial law, or rules of the game, to limit or control the action of management.

Another aspect which is important as a determinant of the effectiveness of people in the work situation is the location of industry. The social contacts, the recreational and school facilities, the customs, the goods and services available to the industrial worker vary from centre to centre and influence the stability of the labour supply and the rate of turnover and absenteeism. They affect the total outlook of the employee whether he be in the managerial or in the non-managerial group.

It is by reason of these general problems, and because people get older, new techniques or inventions are applied, new markets are developed, new skills are acquired and old skills are rendered obsolete, and new social pressures emerge, that it is necessary for the policy makers in industry and commerce to be constantly studying and reviewing the data of industrial living.

It was with a view to formalizing that study that the McGill Industrial Relations Centre was set up two years ago. The plan of operation has been to conduct evening discussion sessions or seminar groups, under the chairmanship of a member of the university staff. Last year, there were seminars on foremanship, collective bargaining, labour law, tensional states in industrial personnel, communication, and wage and salary administration. To these seminars came a limited number of individuals nominated by member firms of the Centre.

The programme of the Centre, including the development of a library, proposes an interesting and unique combination of a university and the community. The success of this effort depends upon this two-sided support, and upon the realization that the practical man in industry, with his contact with the day-to-day problems of industrial relations, and the academic man, with his special training and his analytical tools, working together, may advance knowledge and understanding where such understanding seems to be so urgently needed.

Profit Planning

With the advent of the buyers' market, management has had to concern itself increasingly with the associated problems of cost reduction and maintenance of a satisfactory sales volume. Except for a few types of goods, the consumers have taken charge of our economy, and their preferences and decisions determine the growth or decline of our industrial enterprises.

The early year statements of many company presidents reflected management's expectation that profits would generally decline in view of decreased demand or a drop in prices, or a combination of the two. This prospect was of serious concern to management since profits today are generally in a vulnerable position. A moderate rise in costs, a small decline in volume, together with some drop in the selling price, could make profits disappear for many companies. The danger lies in the fact that much higher break-even points exist, and consequently much lower margins of safety.

It is estimated that four out of five manufacturing companies have higher break-even points today than they had before the war.

For most manufacturing companies, costs rose more during the period of inflation following the war than did profits. As a result, most companies, in order to have reasonable profits, must either maintain a sales volume much higher than was usual before the war or lower their costs considerably. A small decline in sales could wipe out much or all of their present earning power unless they can improve their positions from a cost standpoint.

Companies continue to exist because they produce profits. Thus, it is of importance that management should have the means by which to measure quickly and accurately the effects upon their net earnings of changes in costs, prices, and sales volume which may occur, or which they may consider trying to bring about.

Many companies have made serious mistakes because they did not know how to predetermine the consequences to future profits to be expected from raising or lowering prices, from increasing or reducing wages, from pushing the sale of a new or an old product or from opening up a new sales territory.

The basic requirement for securing a profit is specific planning in advance for a profit within certain defined limits.

A profit should be regarded not merely as something desirable and hoped for, but as a preplanned result of a soundly conceived business policy, based upon the reasoning that income less profit is equal to the allowable expense.

In order to plan for profits, management must have an understanding and knowledge of true costs and profit margins, and of the interrelationship between costs, prices, volume, and profits. To have such an understanding, management must have the means by which to determine what actual costs should be at any volume, and to calculate mathematically the effects upon profits of changes in any of the factors which affect profits, and also the contribution to total profit of each of the company's products or product-lines.

To have the means of forecasting the effects of policy decisions and of controlling them, it is necessary for management to employ certain procedures; amongst these being the correct costing of production; sound budgeting and effective methods of control; segregation of costs into variable and non-variable classifications; charting the relationship between non-variable costs, variable costs, volume, price, profit, break-even point, and margin of safety; and charting the amount of contribution to total profit of different products or groups of products.

It is intended that this discussion of profit planning will be further elaborated in subsequent "Management Notes" and it is desirable that each phase of the discussion be contained separately.

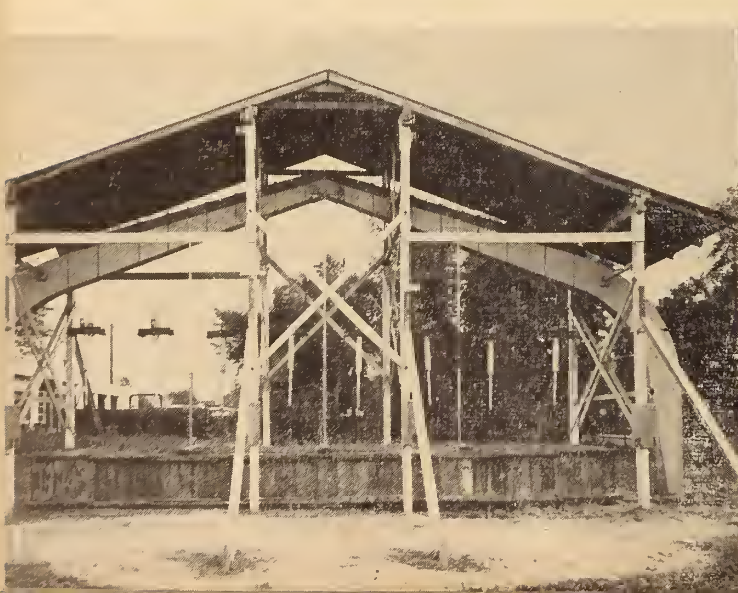
Interesting Timber Arch Test

The Forest Products Laboratory of the Department of Mines and Resources in Ottawa has carried out a series of interesting tests which culminated in the destruction of the 47-foot laminated wood arch shown below.

The tests had a practical aspect in that the arch was constructed under ordinary workshop conditions using casein glue and nailed pressure only. The requirements of the national building code were observed and the design met the requirements of such buildings as auditoriums, drill halls, recreation rooms or similar structures calling for large rooms with unobstructed floor space. The wood was commercial white spruce.

Designed for a load of 27,800 lbs., the arch was erected in November, 1947, and loaded to 48,600 pounds for 6 months. The design load was then carried until June of this year. On August 23 under test to destruction the arch failed only after the application of 126,700 lbs.—four and one-half times the design load.

The first photo shows the set-up for the final test in which load was applied by means of eight aircraft landing gear retraction cylinders. Sixteen railway ties buried six feet underground plus 60,000 pounds of soil above the level of the ground served to anchor the cylinders. The second picture was taken immediately following the failure.



FROM MONTH TO MONTH

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

C. R. Young Dinner

On Friday, Sept. 30th, the Engineering Alumni Association of the University of Toronto tendered a complimentary dinner to Dean C. R. Young who retired on June 30th. About 250 friends and admirers of Dr. Young were on hand at the King Edward Hotel, Toronto, to show their appreciation of one who has contributed so substantially to the promotion of engineering education and the welfare of the profession in general.

The meeting was acceptably presided over by Mr. A. H. Frampton, president of the Engineering Alumni Association. Among the head table guests, who represented a great number of organizations associated with educational and engineering activities, were Dr. Sydney Smith, president of the University and Mr. Kenneth Tupper, the presiding dean of the Faculty of Applied Science and Engineering. The Engineering Institute was represented by Vice President Jas. A. Vance. The occasion was made the opportunity for many old associations to be revived and greatly enjoyed.

An interesting item on the programme was a presentation to Dr. Young by Prof. A. G. Christie, professor emeritus of John Hopkins University, a graduate of Toronto University and a close associate for many years. The gift, which was made available by the large number of engineering graduates, consisted of a Karsh portrait and a 1949 model automobile. The keys were placed in his hand and the car promised the following day. While the photo was not a complete surprise, the auto was. Dr. Young acknowledged the gift with the address which appears on page 747 of this issue of the *Journal*.

Canadian Industrial Preparedness Association Holds Second Annual Meeting

The second annual meeting of the Canadian Industrial Preparedness Association was held in the Royal York Hotel, Toronto, on September 26th with a very large and enthusiastic attendance which included representatives from almost every phase of industry in Canada and also a considerable number of officers from the armed services. The president of the Association, J. G. Notman, M.E.I.C., of Montreal, presented and discussed his annual report which had been printed and distributed prior to the meeting. Membership in the Association now comprises representatives from 268 companies covering a wide range of industrial activity. Twenty-four committees have been set up to study preparedness programmes for their respective lines or products.

Hon. Brooke Claxton, minister of national defence, spoke at the business meeting. He pointed out that defence appropriations for this year are 50 per cent greater than those for 1948 and the defence department has become one of the biggest single buyers in the country. He explained that the defence department had recently placed orders for modern high-power radar equipment to be manufactured in Canada. It had also contracted for ten pre-production two seater jet night fighters, entirely new in design and particularly suited for the defence of the Canadian north. Orders have been placed also with Canadian firms for three escort vessels, specially designed for action against modern submarines and believed to be the first of their type in the world. Such contracts provide stimulus to industry in lines which are of the utmost importance in the defence of Canada.

The Right Hon. C. D. Howe, speaking at the dinner, said that, based on the experience of the last war, plans were well advanced to enable Canadian industry to convert quickly to war production. Men experienced in industry could be appointed immediately and would be provided with draft orders, working date, and background information, as well as all the authority and power they needed. He pointed out that Canada has an industrial capacity greatly in excess of its requirements and so it was of utmost importance that consultation with Great Britain, the United States, and other allies should be maintained in order to ensure the best use of our resources and capabilities. Progress has been made in the standardization of certain equipment and parts which would result in saving of time and effort.

In the afternoon, the members were conveyed to Long Branch Rifle Range for firing demonstrations of several modern weapons and exhibitions of new army clothing for Arctic warfare and tank service, radar and television and other pieces of equipment used by the Army and Air Forces.

—Grand Tour—

Presidential tours go on from triumph to triumph, but the recent September tour of the Maritimes and Newfoundland "seemeth the best of all". It contained new experiences, new thrills, and new territory. Its story is made up of inaugurations, regional meetings of Council, private cars, motor cars, chartered sleepers, railways sidings, steamships, flowers, people, good companions, heart-warming hospitality — and Institute business.

Starting from Montreal on Sunday, September 11th, the party consisted of ten persons — the President and Mrs. Armstrong, Vice-President James Vance, Mr. and Mrs. I. R. Tait, Mr. and Mrs. R. C. Flitton, the General Secretary and Mrs. Wright, and the president's secretary, Denis Barford who throughout the trip was "all things to all people"— much to everyone's pleasure and satisfaction.

Throughout the trip the weather was superb. No matter what it had been previously — and at one place it had rained continuously for sixteen days —it became sunny and warm on the day the party was due. Each branch in turn claimed credit for the local performance, but the president and party knew it was just standard "presidential weather".

The first stop was at Halifax where the programme included a business meeting with the branch executive, a visit to the Halifax Shipyards, and a tour of the harbour by motor launch as guests of the Navy. Also, there were teas and lunches and motor trips for the ladies. The meeting with the members and their ladies was held in the ball room of the Lord Nelson Hotel with branch chairman Prof. Max Baker, presiding.

Members of the president's party pictured during the inspection of Gander Airport (l to r): C. A. Fowler, E. L. Baillie, J. A. Vance, Grant Jack, I. R. Tait, Ira P. Macnab, Imperial Oil's representative at Gander, and R. C. Flitton.

Halifax was the jumping-off place for the Newfoundland visit, but before jumping, the party had been increased to twenty-one by the addition of Vice-President Ira P. Macnab and Mrs. Macnab (Mr. Macnab is also president of the Association of Professional Engineers of Nova Scotia); Mr. and Mrs. C. A. Fowler (as well as being a past officer of the branch Mr. Fowler is now president of the Association of Architects of Nova Scotia); Mr. and Mrs. C. D. Martin and Kathleen Martin (aged two and a half years); Mr. and Mrs. J. T. Farmer and S. G. MacDermot, Montreal; and G. D. " Pete " Stanfield.

The "Atlantic crossing" took 46 hours — all of them pleasant. It should be noted that in the Bingo played the first evening in the lounge the Institute party won seven out of nine cards played. The second evening was devoted to music in which it was claimed the Institute representatives sang just as loudly as the others.

At St. John's the party was met on the dock by the officers of the branch and remained in their close custody for six days. The programme included scenic tours, tea parties, coffee parties, cocktail parties, luncheons and dinners — also a fair amount of work on behalf of the new branch and its inaugural ceremonies. Highlights were the reception given at Government House by the Lieutenant-Governor Sir Leonard Outerbridge and Lady Outerbridge to the president and his party and the officers of the branch, and the inaugural dinner.

The reception was a delightful affair. The charm and warm hospitality of the host and hostess.

In Newfoundland

At left, E. L. Baillie, district manager for Imperial Oil Limited in St. John's and chairman of the new branch, pictured with President Armstrong during a lull in the ceremonies in St. John's.

Top right. Under the watchful eye of Mayor Andrew Carnell, the president signs the visitors' book at the St. John's city hall. Standing in the rear (l to r) are: Irving Tait, Grant Jack, Ed. Baillie, C. A. Fowler, J. A. Vance and Ira P. Macnab.

Upper centre. Some of the party of thirty-five at dinner in the Grand Falls staff house.

Lower centre. A general view of the dinner meeting at the Glynmill Inn, Corner Brook.

Bottom, right. The men of the presidential party posed for this group picture at the Grand Falls staff house of the Anglo-Newfoundland Development Company.

Below. An interior view of *Fogo* during "Operation Sardine". Left side, front to rear seats: I. R. Tait, Mrs. Austin Wright; Denis Barford, the president's secretary; J. A. Vance, R. C. Flitton; Mrs. Macnab, Mrs. Flitton, Grant Jack, the president and Mrs. Armstrong (standing). Right side, rear to front seats: Mrs. Jack, I. P. Macnab, Mrs. Farmer, J. T. Farmer, Mrs. Fowler, C. A. Fowler.

Top. A general view of the luncheon during the council meeting at Sydney.

Bottom. The head table at Saint John, N.B., included Mrs. Macnab, Mrs. Lingley, the president, H. P. Lingley, branch chairman, His Worship the Mayor of Saint John, Mrs. Armstrong, L. O. Cass, Mrs. Wright and I. P. Macnab.

the graciousness of the beautiful old rooms, and the brilliant floral display, made it an outstanding experience. It was a matter of special interest to all to discover that Lady Outerbridge had been born and educated in Toronto.

For the inaugural dinner on Saturday night, September 17th, there were 142 in attendance. The locale was the ball room of the Newfoundland Hotel. It was a brilliant gathering with the guest list including the Lieutenant-Governor and Lady Outerbridge, Attorney-General Sir Edgar Walsh and Lady Walsh, four cabinet ministers, the Mayor Andrew Carnell, Dr. A. G. Hatcher, president of Memorial University; S. W. Fairweather, vice-president of the Canadian National Railways, and representatives of the Navy, Army and Air Forces of the United States and Canada.

E. L. Baillie, the branch chairman, presided. To him the president presented the charter, and to him also were presented the greetings and good wishes of those branches which were represented in the president's party. The speakers were the president who was introduced by Mr. Forbes-Roberts, and the general secretary. It was the opinion of everyone that the branch was well launched and the Institute firmly established in this new territory.

For the trip across the island the party had chartered a sleeping car (so-called!), by name "Fogo". Its normal full accommodation was for 18 people, but by one ruse or another space was found every night for one or more stowaways. The maximum count at any time was 23. The whole Fogo experience was dubbed "operation sardine" When it is remembered that the railway is narrow gauge, the fitness of the title becomes more than ever evident.

In spite of great differences in the sleeping habits of the party, the congestion caused but little inconvenience. The fact that every night three or four wanted to sit up and discuss the day's events in voices that could be heard throughout the car, didn't matter much. The early rising of the poor sleepers and their accounts of the bad night, awoke everybody, but nobody threw anything. Four or five persons at a time in a dressing room which at best was intended only for two and in addition was packed with luggage, the lack of hot water, the absence of outlets for those who pursued their whiskers with electrically driven equipment, were all of little importance. Nothing mattered except that the car should move forward on schedule and that no one should be trampled underfoot in the process.

The original party was depleted on leaving Saint John's by the loss of Mrs. Martin and Kathleen but was augmented by the addition of Mr. and Mrs. Baillie and Mr. and Mrs. Grant Jack. As chairman of the branch Mr. Baillie felt a responsibility in seeing the president and his entourage not only across the island but well out of it also.

Before referring to the three places visited en route, it should be reported that the receptions accorded the party were wonderful. Members, non-members, and officers of the various companies joined together to really extend a welcome. The warmth of the hospitality, the comprehensiveness and precision of the programmes, and the large turnouts, were something long to be remembered.

The first stop was at Gander. Here is located one of the great airports of the world. Every plane flying the North Atlantic comes here for refuelling, from Scandinavia, England, Holland, India, Australia, Africa and the United States. Visits were made to the control tower, the meteorological section, the power house, the communications departments which include, radar, teletype and telephone; the repair shops and so on.

The method of refuelling these great ships is most impressive. The Imperial Oil Company have a net work of mains laid under the runways with sunken hydrants at convenient locations. All the trucks do is to join the aircraft with the hydrant while they meter and filter the fuel.

At the conclusion of the day's sightseeing, the group were guests of Imperial Oil Limited at Esso House, where they had an opportunity to meet many of the administrative heads of the companies whose machines were constantly popping in and out of the airport on their way across the world. Then back to Fogo on a siding, to awake the next morning in the gardens of the good people of Grand Falls.

Here the Anglo Newfoundland Development Company operates a large paper mill. The morning was devoted to a quick trip around the plant. Lunch was followed by a motor trip and tea for the ladies, and a visit to Botwood for the men. The two groups joined together late in the day at the home of Harry Windeler, the company's chief engineer.

Dinner that evening for the men was with about 35 engineers and others interested in engineering. The visitors were placed one at each table so they would have a better chance of getting to know the local group.

An informal moment at Sydney (l to r): the president, Ira Macnab, Norman Parlee, Sydney Branch Chairman, and H. J. Kelley.

The visitors were much indebted to the company for their kindnesses and hospitality. They were the guests of the company at the charming staff house for all their meals that day. Mr. Windeler's leadership in all parts of the programme was indeed appreciated. That night it was a tired group that crawled back to Fogo, and retired with the minimum of disturbance to each other.

Just as on a magic carpet, next morning found the party at Deer Lake. It is from here that the great mill at Corner Brook gets its power. Members and non-members were at the station and under the methodical leadership of Eric Hinton the chief engineer, combined to set up a convoy that took the group over all the high spots of that area, but in time to be back at the Beothic Club for a buffet luncheon.

The luncheon was a delightful affair, put on by the wives of the engineers. When one travels across Newfoundland there are times when he may think he is a long way from civilization, but a sight of this buffet table would convince any one that he was at the centre of culture and civilization. But a sight was not sufficient. The members of the party showed in a practical manner just how much they appreciated it.

From Deer Lake the party was motored to Corner Brook. What a sparkling gem this place has be-

A general view of the record turnout to the Moncton Branch Meeting. In the background below the Institute banner can be seen the general secretary, Mrs. Parsons, the president and the branch chairman, R. L. Parsons (bow tie).

Montreal

Top—During the pre-dinner meeting at Montreal the president was snapped with (l to r) Councillors E. B. Jubien and K. R. Cameron, and the branch chairman, Irving Tait.

Upper centre—The Montreal meeting provided this excellent photo of President Armstrong and J. M. R. Fairbairn, past president and also Mr. Armstrong's predecessor as chief engineer of the Canadian Pacific Railway.

The president chose this occasion of his Montreal Branch visit to present certificates of the Institute's prizes to Guy Lamothe of Ecole Polytechnique (lower centre) and to Claude Howard of McGill (bottom left).

Below—A group of Montreal Branch members listen attentively to the president's ideas on professional consciousness. They are (clockwise from the front of the table): J. A. H. Henderson, E. Nenniger, E. J. Blandford (publications manager), John McPherson, E. B. Jubien, Louis Trudel and Leo Nadeau.

Arvida

The Arvida meeting was as enjoyable as the expressions of the members indicate.

Top left: W. W. Robertson, in the foreground, and (l to r) A. J. O'Dell, A. Robert, W. R. Tracy, G. K. Hector, G. M. K. Davis.

Top right (l to r): J. E. Pickering, D. W. Stairs, H. R. Fee, F. H. Duffy, B. L. Davis, W. A. Dayton, C. J. Tanner, G. K. Clement, B. R. Edwards.

A luncheon with the Arvida Branch executive provided an excellent opportunity to discuss branch and Institute business. Three of the members present were (l to r) J. F. Braun, vice-chairman, Jules Mercier and B. L. Davis.

come! Ideally situated in the Humber Valley, surrounded by wooded mountains, it is indeed a tribute to man's ability to fit his habitation into his surroundings without giving offense to nature. The Bowater's Newfoundland Pulp & Paper Mills Limited deserves great praise for the excellence of this development. Incidentally, the mill houses the fastest paper making machine in the world, and has a total capacity exceeding any other mill.

Upon arrival, tea was served at the community centre (White House), and, for the men, was followed by a business meeting. A great number of questions were asked which indicated a fine interest in the Institute. In all there were 35 local engineers present.

That evening a hundred persons sat down to dinner in the main dining room of the Glynmill Inn. Eric Hinton presided and with him at the head table were the vice-president and general manager of the company, H. M. S. Lewin, the president of the Institute, and the chairman of the new branch — with their wives. The turnout was indeed a tribute to the president of the Institute and to the organizing ability of the local engineers.

The next morning was spent on a tour of the mill, and after lunch, Fogo, and party; minus Mr. and Mrs. Ed. Baillie who at this point, greatly relieved, turned back to St. John's; left for Port-aux-Basques. It was with mixed feelings that this last embarkation was made — sadness at leaving behind so many new friends, but pleasure at the recollection of all the hospitality and good times that had been experienced.

Overnight by boat brought the group to North Sydney at an early hour. Despite that fact many members of the branch were on hand with their cars to transport the people and their fifty pieces of baggage to Sydney.

The special feature of the Sydney experience was the regional meeting of Council which was held in the Isle Royale Hotel on Friday, September 23. It looks as if this were the first such meeting ever held there. Its success should be adequate reason for holding more of them over the next few years. There were in all 28 present and lively discussions followed each item on the agenda.

At the noon recess the branch entertained the out-of-town visitors with refreshments and luncheon. In the evening there was a dinner meeting at the Navy League Building attended by about 90 persons. One would have had to be there to appreciate what took place. Never was there so much delightful but devastating heckling as greeted the chairman, Dr. N. A. D. Parlee, and the speakers — particularly Vice-President Macnab who was well equipped to take it and return it. It was a really hilarious occasion, and yet, when the president rose to speak, you could have heard a pin drop. It was a delightful example of the proper balance between fun and business.

Over the week-end a group of Sydney members and their wives drove the president's party up the Cabot Trail to Ingonish where they put up at the famous Keltic Lodge. This provided a delightful opportunity to " recharge the batteries ", and by the time everyone was back in Sydney Sunday night they felt fully restored and ready once more for the road.

Overnight by rail brought the group — now reduced to twelve — to Moncton by noon Monday the 26th. Here the wonders of Magnetic Hill were demonstrated again. In spite of certain highway alterations in the immediate neighbourhood, the Hill is still as great a success as ever — its magnetism undiminished in spite of the great strain always upon it.

Later a visit was made to the picturesque and famous Rocks but unfortunately the tide had misunderstood the arrangements and was in instead of out. Someone once said when looking at an empty tidal river in New Brunswick " I never before appreciated how much the presence of water contributes to the appearance of a river ". This time the observation was in reverse. The presence of water ruined the feature of the picture — but it was a beautiful drive anyway. Tea followed at a nearby country estate now open to the public — and never was tea more welcome.

At night the ladies and gentlemen met together for dinner at the Moncton Curling Club where the chairman, Lloyd Parsons, put on a splendid performance, ending up with a presentation to the president of a beautiful shiny ball pein hammer with the greeting " Keep hammering away ".

Tuesday noon saw the party at Saint John where they had luncheon at the Union Club — the ladies in one room and the men in another. Later in the afternoon the two groups collaborated for a trip over the aircraft carrier " H.M.C.S. Magnificent " now in drydock. This was a most pleasant and informative experience.

In the evening the branch met with the president's party for dinner in the ballroom of the Admiral Beatty Hotel where chairman H. P. Lingley presided. Next morning there was a business meeting with the branch executive — then refreshments — then lunch — then packing again.

Later in the afternoon the ten " originals " said affectionate goodbyes to the Macnabs and boarded the C.P.R. for Montreal. Sure enough — in the morning there they were in Montreal!

It was a great trip — a unique experience that left all the travellers with vivid impressions of beautiful scenery, kind friends, great distances, and a virile Institute. It was indeed a grand tour.

The return home, however, did not conclude the president's immediate duties since his official visit

Above are two more views of the Arvida meeting.

Upper photo, right to left, far side of table: G. La Brish, J. P. Estabrook, F. A. Brown, A. H. Johnston, J. E. Dyck, K. B. Jelly, W. A. Armstrong, B. R. Edwards, G. K. Clement, C. J. Tanner and W. A. Dayton. Near side of table, left to right: M. L. Laquerre, Paul M. Smith, L. Tessier, H. V. Page.

Lower photo, clockwise around main table: D. R. C. Morris, A. C. Johnson, W. Fraser, A. B. Montizambert, R. W. J. Lewis, F. G. Barker, M. Fredericks, R. D. McQuire, L. W. Geake, K. H. Cram, H. V. Page. At small table in background (l to r): J. B. Eldridge, L. Laventure, S. Monahan, G. Proulx.

Below is another view of the very successful dinner meeting at the Moncton Curling Club.

On October 15, 1949, the new Kitchener Branch of the Institute was inaugurated and the new Branch Chairman, M. A. Montgomery, is shown here receiving the charter from President Armstrong. The complete account of the inaugural ceremonies will appear in next month's *Journal*.

to the Montreal Branch was scheduled for that same evening — Thursday, September 29. He met first with the Branch executive and other special guests and was introduced to the Branch at a dinner meeting in the Mount Royal Hotel's Cardy Hall. The head table guests included, in addition to the presidential party, executives of sections and branches of other professional societies in Montreal. Vice-President J. A. Vance introduced Mr. Armstrong, and Henri Gaudefroy expressed the appreciation of the branch in terms of particular warmth and sincerity.

On Thursday, October 6, the president, with the assistant general secretary, paid his annual visit to the Saguenay Branch. It was Mr. Armstrong's first visit to this important centre of hydro-electric development and industry, and the programme arranged by the branch executive overlooked nothing to ensure that the visitors should be suitably impressed—and they were! Mr. W. F. Campbell, the branch chairman is maintenance engineer of the Roberval and Saguenay Railway, and the assistant general secretary left Arvida with the feeling that he is now qualified to operate a railway. When two experienced railway engineers spend a day together visiting the world's largest aluminum reduction plant, the world's first aluminum arch bridge, and one of the world's newest and finest docking facilities, it is an education for any ordinary engineer fortunate enough to be one of the party.

The affairs of the Institute and the profession were considered in some detail at a small luncheon in the executive dining room of the Saguenay Inn. In the evening nearly eighty members of the Branch gathered from every corner of the Saguenay-St. John area for a lively and profitable dinner meeting. One of the points which became evident in the after-dinner discussions was that the relationship of the Institute and provincial licensing bodies is not fully appreciated by all engineers and it might seem that some further considerations of the matter might be welcomed in the *Journal*.

The foregoing account has not covered the individual branch meetings in detail. This is the province of the branch news editors and the full accounts will, of course, appear in that section of the *Journal* as they become available.

Inferiority Complex?

The thinking that leads Canadian governing bodies, business and industrial concerns, and individuals to turn to the United States for the best in everything — and particularly in the matter of engineering skill — received a rude jolt in the minds of at least a few Canadians when the Avro Jetliner made its first official flight at Malton Airport near Toronto early in October.

While Avro Canada is a member of Britain's Hawker Siddeley Group, it was Canadian engineering and Canadian labour which built the Jetliner and proved that Canadians are fully capable of accomplishing great engineering works.

Actual figures were not given but it was stated that costs of developing the Jetliner were about half the figure considered usual for such a project in the United States.

A number of Americans among Avro Canada's guests were enthusiastic in their acknowledgment that this was a triumph of engineering skill and a Canadian accomplishment which the American aircraft industry will probably not match for several years. It is said that the U.S. has no pure jet transport aircraft past the drawing board stage.

Inspiring as were the story and performance of the Jetliner, an even more inspiring picture was presented to a few of the technically trained visitors who saw Avro's gas turbine division. Here again a Canadian organization has achieved in the "Orenda", a design and performance equal to and perhaps better than that of any aircraft jet engine in the world today.

Avro is presently tooling-up to produce the Orenda in quantity. The few engines completed so far have set a new pattern for Canadian engineering enterprise. A few components have been made by Canadian sub-contractors, a few engine auxiliaries are previously developed units but the vast majority of the engine parts have been made in Avro's own shops. This has meant techniques and operations of which Canadians were considered incapable a few years ago.

Some excellent examples of the type of manufacturing processes new to Canada, and which have been developed by Avro and certain of its key contractors, include the fabrication of a number of large and intricate light alloy castings used in the main body of the engine. The crowning achievement is the fabrication by precision casting, machining and forging to very close tolerances of large numbers of compressor and turbine blades in light alloy and heat resisting alloys. The compressor and turbine turn at a very high rotational speed and to achieve any reasonable performance, their efficiencies must be of the order of 80 to 90 per cent. Only engineers familiar with axial compressor and turbine performance can appreciate the refinements of design and fabrication required to achieve such results.

Such refinements are being achieved at Malton and they are being achieved economically and efficiently. An eminent British authority has stated that Canada has received a better return for money invested in gas turbine development than any other country. An equally eminent Canadian engineer has said that he would not hesitate to turn over to Avro Canada's gas turbine engineering organization a multimillion dollar hydro-electric development or other engineering project with complete confidence that the results would equal the best that could be achieved anywhere.

The *Journal* feels that the story of Avro Canada, and particularly its gas turbine engineering division should be given wide publicity. Perhaps it might induce buyers of engineering services to look around Canada before contacting that "big name" organization in the United States.

The Avro Jetliner. *Avro Canada photograph*

What Is E.C.P.D.?

EDITOR'S NOTE

During the last ten years the Institute has been a member of, and has actively supported the work of, the Engineers' Council for Professional Development. It has been evident to the members of the Institute and of the seven major American professional societies which constitute E.C.P.D. that the co-operative effort has been of value to the engineering profession.

Although the Council and its work are mentioned frequently in the publications of the constituent societies, it is apparent that the main bodies of their members are not acquainted with E.C.P.D.'s history and organization. It is hoped that the following outline will contribute to a fuller appreciation of these valuable activities.

The engineering profession as we know it today, made up of autonomous professional societies looks back on a relatively short history which began in 1818 with the founding of the Institution of Civil Engineers in Great Britain, a designation chosen to distinguish civilian from military engineers. As engineering knowledge grew in scope and complexity, practitioners in the mechanic arts and applied sciences founded societies to aid in the exchange of information relating to their special fields. These units grew in number and size as new inventions created new industries, and industries developed new knowledge and techniques.

One who reviews the beginnings of engineering cannot but be impressed by the comparative youth of engineering. Within the last two years four of the early engineering societies of Western Europe marked their centenaries. American engineering societies are all still in their first century of service, but have followed in general the pattern of development set by the older institutions overseas. Here are some of the founding dates: American Society of Civil Engineerr, 1852; American Institute of Mining and Metallurgical Engineers, 1876; The American Society of Mechanical Engineers, 1880; American Institute of Electrical Engineers, 1884; The Engineering Institute of Canada, 1887; American Institute of Chemical Engineers, 1908.

Until fairly recently engineers and engineering societies in this country concerned themselves principally with new technologies and the mastering of older ones, and little attention was given to the economic and professional status of engineers. To engineers and to laymen, engineering as a profession was an amorphous entity with no method of certification, and few recognized standards or definitions of scope.

In the 1920's a number of engineering societies conducted surveys of such subjects as engineering education and the earnings of engineers which greatly stimulated individual and group interest in matters relating to professional development and economic status. A fairly definite pattern of the important phases in the advancement of the individual engineers began to emerge, from which it became clear that professional development was a continuous process in which the choice of a career, quality of engineering education, professional development of the individual engineer in the years immediately following graduation and eventual recognition as a member of the engineering profession, were important phases.

Time to Think

It was the great depression of the early 1930's with its tragic impact on engineering activity that gave engineers time to think about themselves or what others thought about their work, and to compare engineering with other established professions with respect to economic and professional status.

Young engineers, to whom a future in engineering seemed dim indeed, began to ask the questions which had been the concern of older engineers for some time. What is engineering? What are its professional ideals? When does a man become an engineer? How does an engineer improve his technical skills? How does he win professional recognition?

The Engineers' Council for Professional Development was conceived during this period. It became apparent to many that what was needed was nothing less than a joint programme for "upbuilding engineering as a profession" and establishing recognized methods of certification. As a result of the joint programme sponsored by the major engineering societies, E.C.P.D. was organized on October 3, 1932, and began its work of promoting the welfare of individual engineers.

The E.C.P.D. has now been on the American scene for nearly 20 years. All of its goals have not yet been achieved, but engineers who have attained maturity under its surveillance have benefited tremendously from its activities. Their undergraduate curricula were of a higher technical standard. Their first employers were more aware of their professional needs and more willing to underwrite their industrial orientation. They found more opportunities for post-graduate studies in the communities where they worked, and their professional societies were more sensitive in planning programmes in line with their needs. Much remains to be done, however, before engineering as a professional attains its full stature. This work must be done by younger engineers who are familiar with the goals of E.C.P.D. and who are willing to assume E.C.P.D. responsibility on the local level.

If the profession is to recruit the most capable young men, train them better in schools and industry, and give them the economic and professional satisfactions of which engineering is capable, more engineers must contribute to its programme.

Before an individual can contribute to E.C.P.D. he must be familiar with the basic facts. What is E.C.P.D.? How is it organized? What is its programme? Who does its work?

What Is the E.C.P.D.?

The E.C.P.D. is a conference body which functions as a co-operating agency for the following eight national engineering organizations: American Society of Civil Engineers, membership, 25,820; American Institute of Mining and Metallurgical Engineers, membership, 15,726; The American Society of Mechanical Engineers, membership 28,584; American Institute of Electrical Engineers, 31,754; The Engineering Institute of Canada, 11,078; American Society for Engineering Education, institutional 169; individual 6,059; American Institute of Chemical Engineers, membership, 9,352; and the National Council of State Boards of Engineering Examiners, membership: 51 member boards, 290 legally appointed board members, reporting approximately 135,000 legally registered or licensed engineers.

It is not an independent body but derives financial and personnel support and administrative personnel from constituent organizations. E.C.P.D. functions are promotional and exploratory. Its responsibility is the professional welfare of the individual engineer regardless of his specialized technical field.

How Is E.C.P.D. Organized?

The governing body of the E.C.P.D. is a council composed of 24 members, three from each sponsoring organization, and four ex-officio members who represent the four major E.C.P.D. committees on Student Selection and Guidance, Engineering Schools, Professional Training, and Professional Recognition. The Council has two main functions: It explores professional questions and makes recommendations. E.C.P.D. recommendations go to the governing boards of sponsoring organizations which act on recommendations and administer recommended procedures through their own national and local groups.

What Is E.C.P.D. Trying To Do?

One of the basic E.C.P.D. concepts is that there are four normal stages in the life of the engineer, in each of which the engineering profession has a responsibility. In the first or pre-college stage, the profession must see that only those who are fully qualified should embark on the arduous course of engineering studies. In the second state, that of undergraduate study, the profession must share with the colleges the responsibility for standards of engineering instruction. In the third stage, which begins when the young engineer enters industry, the profession must create the opportunities for further personal and professional growth; and in the fourth stage of full professional practice the profession must concern itself with the legal and professional standards by which the engineer becomes established and recognized.

The E.C.P.D. Charter creates a standing committee charged with responsibility for each of the four stages.

The Committee on Student Selection and Guidance is charged with the responsibility for developing means for educational and vocational orientation of young, potential engineers with respect to the responsibilities and opportunities of the profession. It strives to assure that only those having the personal qualities, aptitudes, and capacities required of engineers will actually seek entrance to the profession through engineering schools.

The Committee on Engineering Schools functions as a medium of co-operation between the engineering profession and the engineering schools. A current application of this function is represented in E.C.P.D.'s programme of accrediting those curricula offered by various colleges of engineering and technical institutes that will insure to graduates a sound educational foundation for the practice of engineering.

The Committee on Professional Training was formed to develop plans to further personal and professional development of young engineering graduates. This was also contemplated for extension to technical personnel without formal scholastic training.

The Committee on Professional Recognition is concerned with the more mature engineer of some practical achievement. It endeavours to develop methods whereby each individual may achieve appropriate recognition by the profession and by the general public.

Student Selection

In the fields of student selection and guidance and engineering schools, E.C.P.D. has achieved notable success. Through its Committee on Student Selection and Guidance, E.C.P.D. was co-sponsor, with the Carnegie Foundation for the Advancement of Teaching and The American Society for Engineering Education, of two widely used aptitude tests of value to students contemplating careers in engineering. In 1947-1948 more than 20,000 students took the tests. In 1948, administration of the tests was turned over to the newly organized Educational Testing Service, with headquarters in Princeton, New Jersey. Also, more than 125,000 copies of the committee's booklet, "Engineering as a Career" have been sold. Posters on the same topic have been distributed among 5,000 high schools.

Engineering Schools

Perhaps the most conspicuous of E.C.P.D.'s accomplishments is its programme of accrediting of engineering curricula conducted by its Committee on Engineering Schools in fulfillment of its original assignment "to formulate criteria for colleges of engineering which will insure to their graduates a sound educational background for practicing the engineering profession." As of October, 1948, some 688 curricula had been inspected, evaluated, and 592 accredited at 137 degree granting institutions, in the United States; 86 of the curricula examined were not accredited. Twenty-three curricula had been accredited at 13 technical institutes in an initial extension of the accrediting programme.

Professional Training

E.C.P.D. achievements in the field of professional training and professional recognition are more difficult to evaluate. Here future progress has its greatest opportunity. More engineering schools are sponsoring evening classes on the graduate level and more graduate engineers are finding it possible to continue their engineering studies while making the adjustments imposed by life in industry. The E.C.P.D. programme has also won the support of many employers of engineers who are assuming responsibility for training opportunities of their staff engineers. Much remains to be done however, especially for engineers in the smaller communities. E.C.P.D. recently published "A Professional Guide for Junior Engineers" to aid the junior engineer in finding his place in the profession.

Professional Recognition

In the field of professional recognition the E.C.P.D. task has been to establish recognized measures of performance to serve as certification of full professional status. Membership in a professional society and a license to practice engineering are currently serving this purpose, but before these steps are fully effective much must be done to establish definitions and standard membership labels and state or provincial registration laws.

News of Other Societies

The next annual meeting of the **Canadian Construction Association** will be in January 1950 at the Mount Royal Hotel in Montreal.

On Saturday, September 10, the **Test Alumni Association** of the Canadian General Electric Company held the annual reunion at Peterborough, Ont. There were 375 testers and ex-testers on hand to enjoy an afternoon of golf, tennis, baseball, volley-ball, horseshoe pitching and fraternization. After an excellent midday meal, Mr. H. M. Turner, president of the company, addressed the gathering. Mr. C. E. Sisson, field secretary of the Engineering Institute, recounted some of the incidents of his early experience in the test. He became associated with the Company in the spring of 1901, and took an active, continuous interest in the establishment of the graduate engineers' course and its operation.

Future meetings of the **American Society of Mechanical Engineers** (29 West 39th St., New York 18, N.Y.) include the 1949 annual meeting in New York City, November 27-December 2; the 1950 spring meeting at the Hotel Statler, in Washington, D.C., the week of April 10; and the semi-annual meeting at the Hotel Statler in St. Louis, Mo., June 19-23.

The Canadian Electrical Association (Room 704, Tramways Building, Montreal 1, Que.) reminds engineers of the annual winter conference in January 16-18, at Quebec City.

The 1950 annual meeting of the **American Society of Civil Engineers** (33 West Thirty-ninth Street, New York 18, N.Y.) will be in New York City, January 18-20.

The **Institute of the Aeronautical Sciences** (2 East 64th Street, New York 21, N.Y.) has scheduled meetings as follows: in Washington, D.C., on December 17, 1949, the Society's 13th annual Wright Brothers Lecture, at the U.S. Chamber of Commerce Building Auditorium; at New York City, Hotel Astor, on January 23, 1950, the I.A.S. annual Honors Night dinner; and also at New York City, Hotel Astor, January 23-26, 1950, the Society's 18th Annual Meeting.

The **Highway Research Board** of the National Research Council (2101 Constitution Avenue, Washington, D.C.) has available information about the twenty-ninth annual meeting of the Board, which will take place in Washington, D.C., December 13-16, 1949.

Correspondence

26th September, 1949

THE INSTITUTION OF ENGINEERS, AUSTRALIA
Sydney, N.S.W

The General Secretary,
Engineering Institute of Canada

This Institution is holding its Annual Conference for 1950 in Tasmania from 27th February to 7th March, 1950. A circular with the tentative programme herewith.

Any members of your Institute residing in Australia or visiting Australia during this period will be welcome to attend the Conference under the same conditions as members of this Institution, and both the Council of The Institution and the Committee of the Tasmania Division assure them of a warm welcome.

If any of your members advise you of their intention to be in Australia at this time, would you convey to them an invitation to attend the Conference.

Yours sincerely,

C. H. D. Harper,
Secretary

Welded Bridge Design Competition

The James F. Lincoln Arc Welding Foundation has announced it's 1950 competition for the design of welded bridges.

There will be 13 cash awards for designs of an all-welded, two-lane, through highway bridge with a span of 250 feet. The only limitations on design are the type of steel and the loading conditions. First, second, and third prizes are 5,000, 2,500, and 1,250 dollars respectively and there will be 10 honourable mention awards of $200 each. The competition opens November 1, 1949 and closes June 30, 1950.

Complete information may be obtained from the Foundation in Cleveland 1, Ohio.

Personals

Notes of the Personal Activities of Members of the Institute

H. S. Rees, M.E.I.C., reveals to the *Journal* an interest in nautical matters. This summer he travelled 2,000 miles in his 30-ft. power cruiser, *Syro,* from Ottawa through the Rideau Lakes, the Bay of Quinte, the Trent System to Georgian Bay, up the famous inside passage and across to the North Shore of Manitoulin Island, returning through the Great Lakes (Huron, St. Clair, Erie and Ontario) and the Rideau to Ottawa. He was accompanied by his family; and Hugh Douglas, M.E.I.C., was aboard, on the return trip, from Little Current as far as Toronto.

Mr. Rees is chief aeronautical engineer of the Department of Transport, Air Services, Civil Aviation Division, Ottawa.

Dr. H. W. McKiel, M.E.I.C., has been appointed to the vice-presidency of Mount Allison University, Sackville, N.B.

Dr. McKiel has been on the staff of Mount Allison since 1913, when he was made professor of mechanical engineering. In 1920 he headed the department as Brookfield professor of engineering, and he was subsequently appointed secretary of the faculty of applied science, dean of that faculty, and, in 1934, dean of the faculty of science.

Dr. McKiel, who was president of the Engineering Institute in 1939, has been a member of the board of governors of the Nova Scotia Technical College for 15 years. He has also been president of the Association of Professional Engineers of Nova Scotia, and vice-president of the Canadian Institute of Chemistry.

Prof. F. L. West, M.E.I.C., has been appointed dean of the faculty of science of Mount Allison University, Sackville, succeeding Dr. H. W. McKiel.

Graduating from McGill University in 1916, Prof. West went to Mount Allison after serving with the R.C.E. in the first world war. He was successively professor of civil engineering, professor of engineering, and prior to his recent appointment he was director of the McClelan School of Engineering at Mount Allison. Officer commanding the New Brunswick Rangers at the outbreak of World War II, Professor West was later attached to National Defence Headquarters. At the war's end he was officer commanding the Khaki University overseas.

Dr. Otto Holden, M.E.I.C., who is assistant general manager of the Hydro Electric Power Commission of Ontario, has been elected a director of district three of the American Society of Civil Engineers. He is the first Canadian to serve the Society in this way.

Mr. Holden is a University of Toronto graduate, and has been on the staff of the Commission since 1913. He received the appointment to his present position in 1947. He is a past-councillor of the Engineering Institute.

Lt.-Col. H. H. Minshall, M.E.I.C., was elected president of the Military Engineers Association at the recent annual meeting of the Association.

Col. Minshall, who is in charge of the erection department of Dominion Bridge Company in Vancouver, B.C., served with the R.C.E. in Canada and overseas in the recent war.

W. H. Stuart, M.E.I.C., who resigned in January 1947, as deputy minister of highways and public works in Nova Scotia, to become assistant general manager of Fred Mannix & Company at Calgary, covering their construction operations in Western and Northern Canada, has now moved to Vancouver in the capacity of executive assistant to the president of Campbell-Bennett Limited, construction engineers and general contractors. Among the Campbell-Bennett operations in British Columbia are a number of government road contracts, two sections of the Pacific Great Eastern Railway extension from Quesnel to Prince George, and construction contract for Columbia Cellulose Company at Prince Rupert.

W. E. Fenn, M.E.I.C., has been appointed director of air services for the Department of Transport, and is stationed at Ottawa, Ont.

Mr. Fenn was connected previously with the Department of Transport as district radio engineer at Winnipeg, but, has been for the past year with the Department of Reconstruction in Winnipeg, in the radio division of the aviation section.

W. H. S. Bird, M.E.I.C., has been transferred by Trans Canada Air Lines to the office of the director of engineering in Montreal. He has been in the Engineering Department of T.C.A. at Winnipeg since 1946. He was in Montreal, before that time, in the office of the technical administrator of Canadair Limited.

Dr. Otto Holden, M.E.I.C.

W. H. Stuart, M.E.I.C.

C. J. Pimenoff, M.E.I.C., of Montreal, recently received an honourable mention award of the Lincoln Arc Welding Foundation, Cleveland, Ohio, for his entry into the Foundation's award programme, "Welded Bridges of the Future".

Mr. Pimenoff is a structural designer with Dominion Bridge Company in Montreal. He was the author of the paper presented to the Annual Meeting of the Institute this year on the subject of the Aluminum Bridge at Arvida, Que.

Paul M. Smith, M.E.I.C., is now a construction engineer in charge of repairs on all dams on Lake Kenogami, Que., in the employ of Concrete Repairs and Waterproofing Co. Ltd. of Jonquiere, Que. He returned earlier this year from India, where he worked for the last few years on irrigation projects, latterly as construction engineer of the Kande Ela Reservoir Scheme at Nuwara, Eliya.

J. B. Eldridge, M.E.I.C., was appointed, in July, electrical superintendent of the Lake St. John Power and Paper Co. Limited, Dolbeau, Que. Mr. Eldridge has been with the English Electric Co. of Canada Ltd., at St. Catharines, Ont., since his demobilization from the R.C.E. in 1946.

E. M. Nason, M.E.I.C., accepted in May this year the position of district engineer with the Public Health Engineering Division of the Department of National Health and Welfare. His headquarters are at Moncton and his district covers the Provinces of New Brunswick, Newfoundland, and the Gaspé Coast of Quebec below Rimouski.

Mr. Nason was town engineer at Bridgewater, N.S., prior to his new appointment.

W. W. Downie, M.E.I.C., has become associated, in the new firm of Downie, Baker and Ahern, Halifax, with E. C. Baker and Col. P. C. Ahern.

The new firm is now engaged in preparing plans for the new St. Mary's College, Halifax, and plans are being prepared for schools in Cape Breton and New Brunswick, and water and sewage systems for several towns in Cape Breton.

Mr. Downie was formerly buildings engineer with the Halifax schoolboard.

G. R. S. Henry, M.E.I.C., has been appointed Montreal representative for the Ethyl Corporation of New York. Mr. Henry has been for the past two years a project engineer for Dominion Rubber Company, Montreal, and was previously with the British-American Oil Refinery, Montreal.

E. N. Walton, M.E.I.C., is now with the Powell River Company, Powell River, B.C. He has been at Niagara Falls, Ont., an electrical engineer with H. G. Acres & Co., since 1946. He had been with Phillips Electrical Works, Ltd., in Montreal, previously.

J. J. Baker, M.E.I.C., is with the National Harbours Board, working at the Montreal Harbour. He worked previously as a designer with Hydraulic Machinery Co. Ltd., Montreal.

W. D. MacKinnon, M.E.I.C., is now engaged as instructor in engineering at the Lakehead Technical Institute, Port Arthur, Ont.

Mr. MacKinnon graduated in civil engineering from the University of Manitoba in 1941. He has recently been with C. D. Howe Co. of Port Arthur, Ont., working on design of reinforced concrete and steel structures.

G. L. Hood, M.E.I.C., has been transferred to North Bay, to assume the position of superintendent of meters, relays and communications, for the northeastern region of the Hydro-Electric Power Commission of Ontario. He went to the H.E.P.C. soon after his graduation from University of Manitoba in 1932. He was in North Bay several years ago, but has since been stationed by the Commission at Port Arthur and at Timmins, Ont.

Charles A. Auclair, M.E.I.C., has recently joined the staff of the Department of Transport, Quebec Canals Division, at Montreal. He was previously in Joliette, Que., engineer superintendent for Quebec Construction Company.

G. M. Wright, Jr.E.I.C., is a junior research officer in the Division of Physics, Nuclear Physics Section of the National Research Council in Ottawa. He graduated from Queen's University in 1944 with a B.Sc. degree in physics. He served with the R.C.N.V.R., and in 1948 was made physics instructor at Royal Military College, Kingston, where he taught until his recent appointment.

Edgar Gilbert, Jr.E.I.C., is at Thetford Mines, Que., with the Asbestos Corporation. He was previously at Wolfe, Que., with the Disraeli Company. He graduated in civil engineering from Ecole Polytechnique, Montreal, in 1947.

Major Malcolm Turner, Jr.E.I.C., was appointed in August last area engineer, New Brunswick Area, Canadian Army, with headquarters in Fredericton.

Major Turner, who was attending Royal Military College, Kingston, at the outbreak of the recent world war, served overseas in the R.C.E. from 1940 to 1945. He entered Queen's University in the fall of 1945 and obtained his degree in civil engineering in 1947. On graduation he was posted to the office of the command engineer, Halifax, where he served until his present appointment.

R. E. Jennings, Jr.E.I.C., of the Canadian Westinghouse Co., Hamilton, has been transferred to the apparatus division of the Sales Department in Toronto. He joined the company soon after his graduation in 1947 from University of New Brunswick in electrical engineering.

F. W. Davidson, Jr.E.I.C., is with the statistical division of the Bell Telephone Company of Canada, in Montreal. Mr. Davidson graduated from University of New Brunswick in 1945 and worked for a year for the plant department of the Bell Telephone Co. in Montreal. He went to Harvard University then, and received a masters degree in business administration in 1948. He returned recently from England where he attended the London School of Economics.

J. L. Allen, Jr.E.I.C., is at Asbestos, Que., with Canadian Johns-Manville. He was previously with Canadian International Paper Company at Hawkesbury, Ont.

A. Paget, Jr.E.I.C., has resumed his duties of secretary-treasurer of the Junior Section of the Ottawa Branch. He is chief draughtsman for Gutta Percha Rubber Co. Ltd., and a graduate of University of Toronto in mechanical engineering, class of 1946.

H. W. McFarlane, Jr.E.I.C., has returned to Canada from England where he has been doing post-graduate work in civil engineering at the University of London.

Mr. McFarlane, will now return to the University of New Brunswick as assistant professor of civil engineering, a position from which he received leave of absence a year ago to take up his post-graduate work on award of the Beaverbrook Scholarship. He graduated from the University of New Brunswick in 1943, and he served with the R.C.E. until 1946.

Rene A. LeBlanc, Jr.E.I.C., has joined the staff of Wallace & Tiernan Limited, as their Montreal district sales and service representative. Prior to this change he was a Montreal representative for the Otis-Fensom Elevator Company of New York.

O. I. Johnson, Jr.E.I.C., has been appointed to the position of civil engineer with the Consolidated Mining & Smelting Co. Ltd., at Trail, B.C. He joined C.M. & S. soon after his graduation from University of Saskatchewan in 1948 and has received the company's training course.

R. H. Morehouse, Jr.E.I.C., is in Halifax with the National Harbours Board. He was formerly field engineer of the Department of Transport, general engineering branch, at Ottawa.

J. O. Miller, Jr.E.I.C., is now employed by Canadian Industries Limited, Nylon Division, Kingston. He is a graduate of Toronto University, class of 1947.

Donald E. MacLean, S.E.I.C., who graduated in civil engineering this year from the University of New Brunswick, is now employed as resident engineer of the Department of Public Works and Highways of Prince Edward Island.

R. A. Carter, S.E.I.C., is employed by Duplate Canada Limited, Oshawa, Ont., as a junior mechanical engineer. Mr. Carter graduated this year from the University of Manitoba with a B.Sc. degree in mechanical engineering.

John Wm. Kinahan, S.E.I.C., is with Proctor, Redfern & Laughlin, Toronto consulting engineers. He graduated this year from University of Manitoba with the degree of B.Sc. in civil engineering.

Above—R. A. Yapp, M.E.I.C. (left) and R. E. Regan, M.E.I.C. (right), whose appointments to the board of directors of Bepco Canada Limited were reported in the October *Journal*.

G. Peter Schwarzkopf, S.E.I.C., is assistant to the chief engineer of Brantford Refrigerator Limited, Brantford, Ont. He is a 1948 graduate in mechanical engineering from University of Toronto.

N. S. Parsons, S.E.I.C., who graduated this year in chemical engineering from McGill University, Montreal, is employed by Building Products Limited, Montreal.

Thomas Downing, S.E.I.C., is with the Department of National Defence in Ottawa, Ont., working as an engineer in the inspection services of the electrical engineering and electronics branch. He completed his electrical engineering course at University of New Brunswick this year.

Marcel Laliberte, S.E.I.C., is in the chemical laboratory of Canada Packers Ltd., Montreal. He graduated this year in chemical engineering from Laval University, Quebec City.

George Boire, S.E.I.C., joined the marketing department of Imperial Oil Ltd., Montreal, after receiving his degree this year from McGill University, in mechanical engineering. He is now at the Sarnia Refinery, where he is taking an industrial sales engineering course, which will be completed in April 1950. He will then return to the Quebec Division and after further field training will assume the position of industrial sales engineer.

L. Gaston Boucher, S.E.I.C., is in Montreal, working as an engineering draughtsman with the Electric Tamper and Equipment Co. of Canada Ltd. He graduated from Laval University, Quebec, this year in electrical engineering.

Visitors to Headquarters

Gilbert G. Murdoch, M.E.I.C., Saint John, N.B., September 28, 1949.

W. A. Shrader, Institute of the Aeronautical Sciences, New York City, October 5.

Harold A. Watkins, San Francisco, Cal., October 6.

Bernard S. Anderson, Hobart, Tasmania, Australia, October 6.

Arthur W. Harrington, M.E.I.C., Albany, N.Y., October 11.

M. L. Brashears, Jr., Garden City, N.Y., October 11.

Harold N. Baker, Purfleet, Essex, England, October 17.

D. D. C. McGeachy, M.E.I.C., London Ont., October 24.

F. W. Gray, M.E.I.C., Victoria, B.C., October 26.

Joseph G. Hoba, M.E.I.C., Windsor, Ont., October 28.

Ken G. Bentley, S.E.I.C., Windsor, Ont., October 28.

J. Wartena, Zwolle, Holland, October 28

E. A. Cross, M.E.I.C., Toronto, Ont., October 28.

H. H. Angus, M.E.I.C., Toronto, Ont.

R. G. Barnard, Aylesbury, England, November 2.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

William Arthur McLean, M.E.I.C., a former deputy minister of highways for Ontario, died suddenly at his residence in Toronto on October 3, 1949.

Mr. McLean was born at Belmont, Ontario, in 1871. He received his education in Ontario public schools and collegiate institutes and in 1898 he qualified as an Ontario Land Surveyor. That year he was appointed assistant instructor in road making for the Ontario Government and he joined the provincial engineering department in 1902, becoming chief engineer in 1910. In 1917 he was made deputy minister of the newly-created department of Public Highways for Ontario, a position which he held until 1923. In 1920 he was required to create an organization to construct and maintain a system of nearly 2,000 miles of provincial highways.

Mr. McLean was actively associated with highway work for more than 50 years. He took a keen interest in the Good Roads Association, of which he was an honorary life member, having been present at the organizational meeting in 1894. He represented Ontario at the International Road Conference in London, England, in 1913, and served as a member of the Royal Commission reporting on roads in Ontario in 1914. He was a past-president of the American Road Builders Association.

In 1925, Mr. McLean became a partner in the engineering firm of Wynne-Roberts, Son, and McLean, Toronto.

For a number of years, until a year ago, Mr. McLean resided at Pickering, Ont., where he was prominent in agricultural affairs, and was the owner of a herd of thoroughbred Holstein cattle.

Mr. McLean was a member of the Institution of Civil Engineers of Great Britain from 1922, and of the Association of Professional Engineers of Ontario. He joined The Engineering Institute of Canada in 1899 as an Associate Member, transferring to Member in 1912. He served on the Council of the Institute in 1919-1921, representing the Toronto Branch.

John Murphy, M.E.I.C., of Ottawa, Ont., who was internationally known in the field of electrical engineering and a pioneer in hydro-electric development, died on September 23, 1949, in hospital after an illness of two months. Before being injured two months ago he had been in excellent health. He had retired in 1938 as senior electrical engineer of the Department of Transport, Ottawa.

Mr. Murphy was born in Ottawa in 1868. He graduated from Ottawa College in 1884, and that year entered the employ of the Bell Telephone Company. He was with the Company only a year when he was placed in charge of an electric light plant at Chelsea, Que. Two years later, in 1887, he was named superintendent of

John Murphy, M.E.I.C.

power houses of the newly established Chaudiere Electric Light and Power Company, Ottawa, retaining those duties until 1906. He worked with the Ottawa Electric Company from 1894 to 1906. From 1887 he was also a consulting engineer for Ahearn and Soper, of Ottawa, on public lighting and industrial power plants, etc. He was also consulting engineer, from 1891, for the Ottawa Electric Railway Company.

In 1906 he entered the Department of Railways and Canals of the Dominion Government as an electrical engineer. He rose quickly in the government service and was later appointed senior electrical engineer. At that time he became an adviser to the Board of Railway Commissioners. Retiring after 32 years with the Department and the Board, he had achieved wide recognition for his publication of the quantitative values of water, ice and iron at hydraulic power houses. He had been acting superintendent of the Rideau Canal for four years. After his retirement he was elected president of the Ottawa-Hull Better Business Bureau.

Mr. Murphy identified himself prominently with numerous technical and professional associations. He served as president of the Canadian National Committee, International Electro-Technical Commission, from 1927 to 1937. He was official delegate to the World Power Conference at Wembley in 1924. He was a delegate also to International Electro-Technical Commission plenary meetings in Italy in 1927, and, in later years, in Japan, Germany and Scandinavia.

Mr. Murphy was a member of the Canadian Committee of the World Power Conferences, the Illuminating Engineering Society, Canadian Electric Railway Signal Association, the American Electric Railway Association and the Professional Engineers of Ontario.

He was a fellow of the American Institute of Electrical Engineers and the Canadian Electrical Association. He was also a member of various committees of the Canadian Engineering Standards Association and the National Research Council.

Mr. Murphy became Associate Member of the Engineering Institute of Canada in 1904, transferring to Member in 1913. He served as chairman of the Ottawa Branch of the Institute in 1916-1917.

NEWS of the BRANCHES

Activities of the Thirty-one Branches of the Institute and abstracts of papers presented at their meetings

Border Cities

W. R. Mitchell, M.E.I.C.
Secretary-Treasurer

H. D. Keil, M.E.I.C.
Branch News Editor

On Friday, October 8, the annual joint meeting with the Association of Professional Engineers was held in the Prince Edward Hotel. A well attended reception and dinner preceded the meeting.

The speaker of the evening was W. J. W. Reid, president of the Association of Professional Engineers of Ontario. He was accompanied by J. M. Muir, secretary and registrar of the Association.

In his talk on **Industrial Organization,** Mr. Reid outlined the methods he would use to organize a new industry. The physical things such as the size, location, design and process are all important but the most difficult part of forming a new industry is the organizing of the people.

The people are divided into two groups: those who work in the plant and those outside who come in contact with the organization. Industry must sell itself to the public in order to sell its product. A public relations staff should therefore be planned. Good public relations is a boost to employee relations. Employees like to work for an organization that is respected by the people at large.

In forming the group of individuals that work for the industry it is more realistic to make the organization suit the employees available rather than take a tailor made organization and try to find the people to fit it. First management must determine what its policies regarding the employee will be. The typical relationship between employer and employee has not been good in the past and is not much improved at present. The only satisfactory relationship is one that is built up on day to day experience. The worker must be treated as another individual. It must be realized that he has a sense of dignity, a need for the esteem of others, the basic instinct for survival, a desire for security and a social instinct to associate with his equal. If an industry meets these needs men will be happy, co-operative and productive.

Mr. Reid was introduced by J. Clarke Keith and thanked by A. D. Harris.

Edmonton

E. K. Cumming, M.E.I.C.
Branch News Editor

O. G. Kelly, M.E.I.C.
Secretary-Treasurer

The Edmonton Branch of the E.I.C. were guests of the North West Brewery Friday afternoon, October 7. One hundred and fifty members and friends were taken on a conducted tour of the Brewery. The automatic mechanical bottling section was explained and shown in operation, then the storage tanks, and in the cooking and brewing section the members had a chance to view the only all stainless steel brew kettle in Western Canada.

The members were then taken to an upper floor where a wonderful buffet supper was served consisting of all varieties of cold meats, cheese, pickles, nuts and refreshments.

This was the first meeting of branch after the summer holiday and the chairman, T. Dalkin dispensed with any business but announced that the second annual ball and banquet would be held in the Macdonald Hotel on October 27.

J. G. MacGregor expressed the thanks of the members to the North West Brewery officials, J. Patterson, manager, and W. Spershott, brew-master, and their staff for putting on a very good show.

Lethbridge

David Cramer, Jr.E.I.C.
Secretary-Treasurer

Members of the Lethbridge Branch of the Institute gathered in the Marquis Hotel on Saturday, October 15, for their first dinner meeting of the new season, and to hear Walter C. Lewis give an address on **The Fundamentals of Effective Speaking.** R. D. Livingstone was in the chair.

Mr. Lewis demonstrated the faults of many speakers, and showed how they may be avoided. He pointed out several ways of controlling nervousness, such as proper breathing, or clasping the hands tightly behind the back.

The speaker went on to outline several fundamentals which would result in effective speaking. He stated that one should speak on a level at which the audience would understand; should address the whole audience, and not one person or a corner of the room. He suggested that a speaker use small cue cards from which the talk is outlined rather than large sheets of paper.

Mr. Lewis' talk was very timely and of great interest to the members. J. M. Campbell introduced the speaker and a vote of thanks was expressed by A. J. Branch.

Dinner music by Brown's Musical Trio community singing led by R. S. Lawrence, and vocal selections by Bill Gordon were a very welcome addition to the dinner meeting.

Ottawa

J. C. Elliott, M.E.I.C.
Secretary-Treasurer

Aeronautical Section

F/L J. A. G. Diack
Secretary-Treasurer

The Aeronautical Section was organized on February 14, 1949, and a slate of officers elected. A constitution which had previously been drafted by a committee of interested parties was approved subject to amendment in the future, as the need arose.

During the year all interested in the activities of the Section were invited to attend, irrespective of whether they were members of the Institute of Aeronautical Sciences, Royal Aeronautical Society, or the E.I.C. No fees were levied and the Section functioned on funds made available through the E.I.C.

The following programmes were arranged during the season: February 14, 1949—organization meeting—showing of four films of general aeronautical interest; March 9, 1949—Mr. Walter Tye, O.B.E., discussed **Modern Problems in Airworthiness;** March 30, 1949—A/V/M A. Ferrier, C.B., M.C., addressed the Section on the subject of **Are Transport Aircraft Developing in the Right Direction;** May 4, 1949—S/L E. P. Bridgland spoke about **Cold Weather Operation of Aircraft;** June 1, 1949—Dr. P. D. McTaggart-Cowan, M.B.E., addressed the Section on the subject of **Some Trends in Aviation Meteorological Service.**

All the meetings were held in the Auditorium of the National Research Council, Sussex Street, Ottawa. The average attendance was approximately fifty.

The Section was visited on June 11 to 15 by the president of the Royal Aeronautical Society, Sir John Buchanan, the secretary, Capt. J. L. Pritchard, and other officers of the Society. A programme of tours and entertainment was arranged in conjunction with the National Research Council, Air Transport Board, and the Royal Canadian Air Force. During the visit the affiliation of the Section with the other large aeronautical bodies was discussed but no definite agreements reached.

The mailing list of the Section has 156 names, of which 48 are Ottawa resident members of either or more of the larger aeronautical bodies. Twenty-one meeting notices are sent to key men in the Canadian Aviation industry outside of Ottawa, and six complimentary cards are mailed. Notices of meetings are displayed at the National Research Council and in R.C.A.F. Daily Routine Orders at Air Force Headquarters, Air Materiel Command, and Station Rockcliffe. Reports of meetings have appeared in the Ottawa evening newspapers.

Peterborough

M. M. Uloth, jr.e.i.c.
Secretary-Treasurer

J. C. Allan, m.e.i.c.
Branch News Editor

Following the custom of past years, the opening meeting of the Peterborough Branch for the 1949 fall season took the form of an inspection tour. The trip was divided into two parts, first a visit to the site of the Des Joachims development on September 24 and afterwards a visit to the Stewartville Generating Station on September 25.

Thirty-four members travelled from Peterborough to Des Joachims by bus and car, lunching en route at Pembroke and arriving at their destination at 4 p.m. Using a relief map of the area, A. A. Richardson, engineer in charge of the project, gave an outline of the work accomplished and that yet to be done. He and Keith Scott of the Publicity Department of the Hydro Electric Power Commission of Ontario, then accompanied the group on a tour of the site. The main dam had been closed two days previously, and the flow of the Ottawa River was through the control dam at the eastern end of McConnell Lake. A fine view of the main dam, auxiliary dam, and concrete mixing plant was afforded from the main lookout on the upstream side of the dam. The group then crossed to the Quebec side of the river by means of the access bridge and inspected the beginnings of the power house and the penstock installations. After hearing an explanation of the operation of the extensive concrete plant, the party travelled to McConnell Lake dam, where the closing of some of the sluices was about to begin. The return to the reception centre was made via the bridge over the discharge channel. The group remained at the camp that night as guests of the H.E.P.C., and during the evening enjoyed bowling and billiards in the camp's excellent recreation centre.

After breakfast at the camp, the group left for the Stewartville Generating Station, and stopped at Renfrew for dinner. At Stewartville one machine was running, and the visitors had an excellent opportunity of observing conditions in a modern hydro plant under operating conditions. To some the control room was the centre of attraction, while to others the hydraulic system held the greatest attraction. After the inspection was completed the members returned by bus and car to Peterborough, ending one of the most successful trips in the history of the Peterborough Branch.

Recorded by G. T. Davis, jr.e.i.c.

Saint John

W. M. Brenan, m.e.i.c.
Secretary-Treasurer

A. R. Bonnell, m.e.i.c.
Branch News Editor

Tuesday, September 27 marked the annual visit of the president of the Institute to the Saint John Branch. The president and his party were tendered a luncheon at the Union Club by the executive of the Saint John Branch.

In the afternoon a tour was conducted through the *H.M.C.S. Magnificent* in dry dock at East Saint John. The officers of the ship, after serving tea, explained the intricacies of the engine room and the general workings of Canada's capital ship.

Dinner in the evening was held in the Georgian Ball Room in the Admiral Beatty Hotel with H. P. Lingley, chairman of the Saint John Branch presiding.

A welcome to the engineers was extended by Mayor E. W. Patterson. A toast to the ladies was proposed by A. A. Turnbull, and Mrs. Armstrong, wife of the president replied with interesting talk on her trip through Newfoundland.

A welcome to the E.I.C. members on behalf of the New Brunswick Association of Professional Engineers was given by John Mooney, vice president of that Association. T. C. MacNabb thanked Mr. Mooney for his welcome. Dr. Austin Wright, and Ira Macnab spoke briefly on Institute affairs.

John Flood introduced the president, John Armstrong, of Montreal. Mr. Armstrong said that the E.I.C. now exceeds 12,000 members in 31 branches from St. Johns, Nfld., to Victoria, B.C. The Institute is one of the relatively few national engineering organizations in the world which has a place in its membership for all engineering students, all young engineers and all senior engineers, regardless of their specialties. Mr. Armstrong expressed the opinion that all engineers should strive to attain professional consciousness as well as professional status. The belief is fairly widespread that the best way to obtain lucrative employment is to emigrate to the United States, obtain employment with some international engineering organization there, and in due course be sent to Canada to work. The president remarked, however, that as long as the abilities of Canadian engineers go unpublicized, this fallacy will persist. The Institute is attempting to overcome this idea, he said.

On Wednesday morning an informal meeting was held with the president, the general secretary and the executive of the Branch.

St. Maurice Valley

J. B. Edwards, m.e.i.c.
Secretary-Treasurer

The golf tournament of the St. Maurice Valley Branch of the Institute, on October 1, at the Ki-8-eb, Trois-Rivieres, with a plant visit for non golfers, was a complete success. Forty members chose outdoor activities, while about twenty members were met by Mr. T. Ross at the gates of the International Paper Company and were guided on a thorough visit of the mill. Later in the afternoon, both groups joined at the Club for a cold supper where singing and applause greeted the announcement of tournament prize winners.

Mr. Emile Jean, managing director of *Le Nouvelliste*, Trois-Rivieres, very appropriately addressed the audience on the art of taking life on the good side and preventing early hardening of the arteries. He was thanked by Past-Chairman M. Eaton.

The meeting was presided over by S. Williams, branch chairman, and Ron Mackay announced tournament winners as follows. For 18 holes: low gross—A. Pinard—83; 2nd low gross—H. Walker—84; low net—M. Eaton—75; 2nd low net—J. B. Simpson—77. For 9 holes: Low gross—A. McKeagan—46; 2nd low gross—R. Hall and R. Mackay—50; low net—A. McLeod—35; 2nd low net—I. Smith and R. Cuthbert—39.

The executives of the branch are grateful to the directors of the Ki-8-eb Golf Club for its hospitality which contributed to the complete success of the annual golf tournament and to the Interational Paper Co. for permission to visit the mill.

Vancouver

Alan Fletcher, jr.e.i.c.
Secretary-Treasurer

Stuart S. Lefaux, jr.e.i.c.
Branch News Editor

On Tuesday, October 4, members of the Engineering Institute of Canada and their sons, together with members of the American Institute of Electrical Engineers, were treated to a private inspection of *H.M.C.S. Ontario*. Approximately 130 persons were present and, in groups of 10, were conducted on a tour of the ship which included visits to the steaming boiler room, the engine room, turbo generators, telephone exchange, steering compartments, etc.

It proved most enlightening for all members to be made familiar with the many intricacies of the operation of Canada's largest battle craft. It could be truthfully said that there was not a cubic inch of space wasted in the design and layout. The complement of 700 men needed to man the ship included many mechanical and electrical engineering officers.

After an exhausting trip through the ship, climbing over bulkheads, up and down ladders, and walking a mile of passageway, the members welcomed afternoon tea in the ward room.

Rear Admiral H. G. DeWolf, flag officer, and Captain H. F. Pullen were responsible for the splendid arrangements for the trip. It was most gratifying to the executive of the Vancouver Branch to have such a fine turnout, and all members agreed that it was a truly worthwhile afternoon.

* * *

On Wednesday, September 21, the Annual Ladies' Night of the Vancouver Branch was held in the Stanley Park Pavilion, when about one hundred and fifty members of the Vancouver Branch and their wives and escorts attended the social evening.

Three films were shown by the Public Relations Department of the B.C. Electric Railway Company. "We Decorate Our Home," a colour film, showed how to modernize the home with modern materials and paint. A Westinghouse film demonstrated the "Home of Tomorrow" with its many electrical appliances. "Australia To-day," a colour travelogue, depicts the natural resources, cities and life in Australia.

Cocktails were served before the showing of films and light refreshments afterwards. It was a most enjoyable evening and a splendid opportunity for members and their wives to become better acquainted with their E.I.C. associates.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

November 20th, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the December meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of tbe third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to tbe final examination of a bigh school, or tbe matriculation of an arts or science course in a scbool of engineering recognized by the council or sball be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he sball be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained tbe age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but wbose pursuits, scientific attainments or practical experience qualify him to cooperate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ARENA—GAETAN, of Montreal, Que. Born at Piazza Armerina, Italy, June 1, 1922. Educ.: Dr., Industrial Engrg., Univ. of Palermo, 1947; 1947-48, researcher, radio appliances and receiver sets, I.S.A.R.E. (Sicilien radio manufacturers); 1948-49, professor in electronics and electrical measurements, Instituto Tecnico Industriale, Cattanissette, Italy.

References: S. T. Fisher, E. G. M. Busso, C. B. Fisher, G. A Wallace, E. R. Hammond.

CAMPBELL—MICHAEL RODERICK, of Sydney, N.S. Born at Irish Cove, N.S., Feb. 28, 1901. Educ.: B.A., 1923; M.A., 1924, St. Francois Xavier; M.Sc., Chemical Engrg. Practice, M.I.T., 1927; with Dominion Steel & Coal, as follows: 1920-26, summer employment, 1927-28, open hearth dept., 1928-32, asst. supt., open hearth dept., 1932-34, Assoc. Professor of Chemistry, St. Francois Xavier Univ., Antigonish; with Dominion Steel and Coal Co., Sydney, open hearth dept., 1934-46, asst. supt., 1946 to date, supt.

References: C. M. Anson, J. H. Fraser, J. A. MacLeod, W. S. Wilson, S. G. Naish, N. A. Parlee, C. N. Murray.

GILLIES—GEORGE BRODIE, of Braeside, Ont. Born at Vancouver, B.C., Sept. 5, 1913. Educ.: B.A.Sc., British Columbia, 1936; 1924, (summer), student engr., Goldbridge Gold Mine; 1935, (summer), student engr., Wind Pass Gold Mine, 1937 to date, elect. and mech. supt., i/c operation of two sawmills from woods to finished products, Gillies Bros. & Co., Ltd., Braeside, Ont.

References: K. Bews, J. C. Elliott.

LEEMING—HARRY HORSFAL, of Toronto, Ont. Born at London, England, Aug. 15, 1898. Educ.: Rugby College, England, 1913-14; Special Elect. Engrg. Course, Univ. of Toronto, 1917-18; R.P.E., Ontario; Member, American Institute of E.E.; with Hydro-Electric Power Commission of Ontario, as follows: 1918, on constrn., Queenston develop't., 1918-20, dftsman. on elect. layouts, 1920-21, res. elect. engr., Nipigon Power Develop't., 1921-30, asst. system elect. engr., Toronto, 1930-40, system elect. engr., responsible for design, preparing specifications for main equipt., purchase agreements and instructions to constrn. organizations relating to elect. instlns. for power develop't., etc., 1940-47, system planning engr., Northern divn., responsibility for planning of system networks incl. network analyses studies, planning of systems to meet future load growth, etc., etc., 1947-48, mgr., North Eastern region, included organizing of the region, at present, director i/c 25/60 cycle frequency change over project in South Ontario being undertaken by the H.E.P.C.

References: R. L. Hearn, O. Holden, J. R. Montague, E. P. Muntz, S. W. B. Black, A. H. Hull, E. M. Wood.

LUCAS—JOHN GARTH, of Peterborough, Ont. Born at Montreal, Que., Feb. 15, 1920. Educ.: B.A.Sc., (Elect.) Univ. of Toronto, 1943; R.P.E., Ontario; 1943-46, R.C.N.V.R.; 1946 to date, asst. division engr., industrial and central station engrg. division, Canadian General Electric, Peterborough, Ont.

References: G. R. Langley, J. L. McKeever, A. R. Hailey.

TOCZYLOWSKI—HENRYK STANISLAW, of Granby, Que. Born at Zakopane, Poland, Dec. 15, 1903. Educ.: Diplom. Engr., Elect., Technical Univ. of Warsaw, 1929; A.M., I.E.E., London; vacation courses as undergrad., 1923, coal mine, elect. dept., Kasimierz, Poland; 1924, steel mill, Starachowice, Poland; 1926, power station, St. Ouen, France; 1927 and 1928, Polish State Rlys., elect. workshop, Wilno; 1929-30, traffic engr., Municipal Tramways, Warsaw, Poland; 1931-32, designer i/c of test plant, (elect. workshop), Skoda Works, Poland; with Polish State Telephone & Radio Works, Warsaw, as follows: 1932-33, workshop engr., 1933-34, design engr., 1934-35, tech. salesman, 1935-38, chief of sales dept., 1938-39, asst. mgr.; Admiralty Signal & Radar Establishment, England, as follows: 1941-42, Experimental Officer, 1942-44, Scientific Officer, 1945-48, Senior Scientific Officer, 1948 to date, head of elect. dept., Beaconing Optical & Precision Materials Co., Ltd., Granby, Que.

References: J. Pawlikowski, A. Bielinski, B. Szczeniowski, W. Golubowski, J. Sobolewski, C. Klawe.

WALLACE—JAMES RODERICH, of Sydney, N.S. Born at Westville, N.S., July 12, 1918. Educ.: B.Eng., (Metall.), 1940; Member, C.I.M.M.; 1938, (summer), Hollinger Consolidated Gold Mines Ltd.; with Dominion Steel and Coal Corp. Ltd., as follows: 1933, (summer), 1940-42, observer inspection and control of electric furnace practice, 1943-46, asst. supt., coke ovens dept., 1946 to date, asst. director of research and develop't.

References: N. A. Parlee, J. H. Fraser, C. M. Anson, A. Miller, W. S. Wilson, C. N Murray.

WALLER—JASON JACK, of Montreal, Que. Born at Montreal, Que., Jan. 28, 1914. Educ.; B. Eng., (Chem.), McGill, 1936; Member, American Society for Metals; 1937-38, weight and stress engr., Noorduyn Aviation Ltd.; 1938-47, asst. chief engr., Fairchild Aircraft Ltd.; 1947 to present, chief, materials and process section, Canadair Limited, Montreal, Que.

References: T. A. Harvie, J. A. T. Butler, E. C. V. Norsworthy, P. W. Gooch, J. P. Donnelly, W. D. Laird.

FOR TRANSFER FROM THE CLASS OF JUNIOR

BERESFORD—MORRIS MASKEW, of Belleville, Ont. Born at Winnipeg on Nov. 6, 1920. Educ.: B.Sc. (Elect.) Manitoba, 1942; summers, 1937 rodman on survey party, asst. to engr. on road work, Manitoba Provincial Government; 1939, asst. to engr. under Prairie Farm Rehabilitation Act, Dominion Government, Winnipeg; 1940, dftsman., Trans Canada Airlines, Winnipeg; 1941, laboratory instructor, Airforce, Radio Technicians Course, Univ. of Manitoba; 1942-46, Cdn. Army Signal Corps, Officer Commanding various units; 1946-49, sales engr. Point to Point and Aeronautical Radio, Northern Electric Co. Ltd., Mtl. (St. 1942, Jr. 1946)

References: A. B. Hunt, F. F. Fulton, N. M. Hall, A. E. MacDonald, G. H. Herriot.

BROCHU—BLAISE, of Montreal. Born at Quebec on July 17, 1914. Educ.: B.A.Sc. (C.E.) Laval Univ., 1941; R.P.E. Que. summers, 1938, East Malartic Gold Mines; 1939, Asbestos Corp. Thetford Mines; 1940, Noranda Mines; 1941, Quebec Prov. Dept. of Mines; 1941-42, Noranda Mines; 1942-43, asst. res. engr. on B.C. Highway Project, Dept. Mines & Resources, Ottawa; 1943, chief concrete inspector on Maitland Airport, Milton Hersey Co. Ltd.; 1943-48, chief of tech. dept., LaSalle Builders Supply Ltd.; 1948 to date, design and sales of heating systems, National Heating Products Ltd. (Jr. 1944)

References: M. F. Macnaughton, E. G. Carmel, A. Pouliot, G. Beaulieu, J. G. Chenevert.

CAMERON—ALASTAIR DUNCAN, of Montreal. Born at Fredericton, N.B., on Oct. 28, 1920. Educ.: B.Sc. (Civil) New Brunswick, 1942; R.P.E. Que.; 1942-45, commissioned service, Royal Canadian Artillery; 1945-47, dftsman., Dominion Bridge Co. Ltd.; 1947 to present, designer (office) and resident engr. (field), Montreal Engineering Co. Ltd. (St. 1942, Jr. 1943)

References: E. O. Turner, W. O. Sorby, J. Smith, J. H. MacLaren, H. J. McLean, J. K. Sexton.

CASSON—HAROLD VINCENT, of Pointe Claire, Que. Born at Victoria, B.C., on May 24, 1920. Educ.: B.A.Sc. (Elect.) B.C., 1942; R.P.E. Que.; 1941 (6 mos.) thawing engr., Yukon Consolidated Gold Corp., Yukon Territory; 1942-45, engr. officer, Royal Cdn. Navy; 1945-46, plant engr. Canada Creosoting Co. Ltd.; 1946, articled accountant, R. J. Casson & Co.; 1946-47, industrial engr., investigating, reporting upon applicant's plant, equipment, methods, direct industrial engrg. work, plant admn., Industrial Development Bank, Montreal. (Jr. 1945)

References: B. O. Heron, B. S. Taylor, J. Zabinski, A. M. Swan, P. E. Paquin.

DYKE—JOHN MORLEY, of Montreal. Born at Montreal on April 15, 1920. Educ.: B.A.Sc. (Mech.), Toronto, 1943; R.P.E. Que.; summers, 1940 and 41, machinist's helper; fitters; John Inglis Co.; 1942, dftsman., boilers, Babcox Wilcox & Goldie McCulloch; 1943-45, Royal Cdn. Navy; 1943-44, Engr. Officer Afloat, i/c of mech. constrn. and research project and navel research establishment; 1945-47, boiler design dftsman., John Inglis Co. Ltd.; with C.P.R. as follows: 1947 to July 1949, design dftsman., power plants; at present asst. engr. power plants, Mtl. (St. 1943, Jr. 1946)

References: J. W. Hughes, A. E. Allcut, W. A. Newman, W. A. Osbourne, G. N. Martin, R. F. Legget, F. J. Raskin.

HARKNESS—WILFRED DICKSON, of Stevens, Ont. Born at Shantung, China, on Nov. 17, 1918. Educ.: B.Sc. (Forest Engrg.) New Brunswick, 1941; 1941-44; chief of field control, i/c timber inventory, field lay-out, limit improvement surveys, Abitibi Power & Paper Co. Ltd., Port Arthur Division, Woods Dept.; 1944-46, forest engr., i/c highway layout and constrn., research in mechanical development, Bathurst Power & Paper Co. Ltd.; 1946, logging engr. i/c management planning, operational dev'mpt., Cia. Industrial de Antequique, Atenquique, Jalisco, Mexico; with Marathon Paper Mills of Canada Ltd.; 1946, district logging supt. i/c logging operations, Stevens & Hornepayne Districts; at present divisional forest engr. i/c operational research, dev'mpt. of mechanized logging methods. (Jr. 1943)

References: G. E. LaMothe, W. Thornber, G. H. Mikkelborg, A. F. Baird, L. F. Grant, R. D. Harkness, D. R. Beckett.

IDENDEN—FRANCIS STEVENSON, of Venezuela, S.A. Born at Toronto on Sept 25, 1915. Educ.: B.A.Sc. (Mech.) Toronto, 1941; summer 1940, St. engr. Imperial Oil Co. Ltd., Sarnia; 1941-42, asst. to design engr. Trinidad Leaseholds Ltd., design work reference refinery mechanical, utilities power plants, also acted as relief engr. for field engrs. (Rigbuilding Constrn. Mtce.); 1942-43, mech. engr. U.S. Navy Engineers, operating base, Trinidad, B.W.I.; i/c mechanical engrg. section; 1943 (Oct.)-1944 (April) (1) field mechanical engr.; (2) purchasing agent, Demerara Bauxite Co. Ltd., Mackenzie, S.A.; Engr. Grade 1 with the Shell group of Oil Companies in Venezuela, with the Caribbean Petroleum Co. in Maracaibo as follows: 1945-46, special projects engr., central engrg. dept.; 1946-48, office engr., operating and mtce. dept., i/c control of dept. engrg. budgets, planning, admn.; 1948 to date, office engr., La Concepcion Field, Shell C.P.C., duties as above only on larger scale. (Jr. 1944)

References: W. Stuart, F. X. Granville.

LONGWORTHY—WILLIAM HAROLD, of Negritos, S.A. Born at Regina, Sask., on Jan. 3, 1921. Educ.: B.Sc. (Mech.), Sask., 1942; summers, 1940 and 41, trainee, Imperial Oil Ltd., Sarnia, Ont.; 1943-44, Sub. Lieut. (E) i/c machinery of H.M.C.S. Miramichi; 1944-45, i/c machinery of H.M.C.S. Beacon Hill; 1945-49, petroleum engr., International Petroleum Co. Ltd., Talara, Peru, S.A. (Jr. 1944)

References: T. B. Smith, N. B. Hutcheon, I. M. Fraser, R. A. Spencer, J. H. Parkin.

MacAULAY—ROY DANIEL, of Owen Sound, Ont. Born at Sydney, N.S., on Dec. 5, 1916. Educ.: B.E. (Mech.), Nova Scotia Tech. Col., 1942; summers with Dominion Iron & Steel Corp., Sydney, N.S., as follows: 1937 and 38, yard crew of the coke ovens, laboring; 1939, moulders helper, Foundry; 1940 and 41, machinist; with Cdn. Westinghouse Co., Hamilton, as follows: 1942, two year apprentice course, followed by one year in engrg. office; May, 1942 to Oct., inspector in 3.9" gun plant; Oct. to May, 1943, air brake dftg. office; May, 1943-April, 1944, i/c of testing of 24" torpedo engines; April, 1944 to end of course March, 1945, divided into welding dept., pattern shop, foundry and engineering office as dftsman.; 1945-46, millwright, in Billet Mill, and Strip Mill, Steel Co. of Canada, Hamilton; with W. M. Kennedy & Sons, Owen Sound as follows: 1946, (2 years) i/c foundry production of cast iron castings; 6 months, foundry estimator; at present, responsible for correctness of all castings (except metal analysis) in Dept. known as the planning dept (St. 1942, Jr. 1946)

References: T. D. Kennedy, A. A. Moline, L. C. Sentence, H O. Peeling, G. L. T. Vollmer.

McCALLUM—JOHN FRANCIS, of Espanola, Ont. Born at Moose Jaw, Sask., on Jan. 31, 1918. Educ.: B.Sc. (Civil) Queen's, 1942; R.P.E. Ont.; summers, 1939, instru'man, Dept. of Transport; 1940, inspector, R.C.A.F.; 1941, inspector, C. D. Howe Co.; 1942, Jr. engr., Howard Smith Paper Mills; 1942-44, engr. i/c construction R.C.A.F.; with KVP Company as follows: 1944-46, constrn. engr.; 1946-49, asst. engr.; at present resident engr. (St. 1942, Jr. 1946)

References: H. T. Ralph, D. L. Rigsby, R. G. Rowan, D. S Ellis.

McLEOD—CEDRIC WILLIAM, of Three Rivers, Que. Born at Halifax, N.S., on July 16, 1918. Educ.: B.Eng. (Mech.), Nova Scotia Technical Col., 1942; 1941, dftg. Imperial Oil Refinery, Dartmouth, N.S.; 1942, asst. plant engr., designing, layouts of equipt., Halifax Shipyards; 1942-46, Officer R.C.E.M.E., i/c tank repairs, guns, other mech. equipt.; 1946 to date, asst. mech. supt. mtce. of all equipt., St. Lawrence Paper Mills, Three Rivers, Que. (Jr. 1945)

References: A. M. Hubley, D. R. Catford, E. R. McMullen, C. Neil, J. B. Edwards, S. E. Williams.

NORMAN—ARTHUR WARREN, of Halifax. Born at Boston, Mass., on Jan. 27, 1925. Educ.: B.E. (Mech.), Nova Scotia Tech. Coll., 1946; summers, 1944, transitman Dept. Highways and Public Works; 1945, machine shop asst. Moirs Ltd.; 1946, Bell Telephone Co., Mtl.; with Construction Equipment Co. Ltd., Halifax, as follows: July, 1947, to date, asst. to mgr. in direct charge of plant rentals and machine shop, steel fabrication, estimating of machine shop repair jobs and marine repairs, connected with Marine Dept. of Foundation Maritime Ltd. and outside marine equipt., Halifax. (St. 1945, Jr. 1948)

References: E. M. Woollcombe, A. R. Chadwick, J. G. M. Loomis, J. T. Lang, J. R. Mills.

RICHARDSON—GEORGE WILLIAM, of Windsor, Ont. Born at Montreal on July 7, 1914. Educ.: B.Eng. (Mech.), McGill, 1942; R.P.E. Ont. 1935-41, machinist apprentice C.N.R.; 1942, Jr. research engr., National Research Council, Ottawa; with Ford Motor Co. of Canada Ltd. as follows: 1942-43, chassis engr.; 1943-48, engr. i/c of dynamometer room operations; at present supervisor, experimental engineering, Windsor, Ont. (St. 1940, Jr 1943)

References: H. Lillie, J. G. Hoba, J. E. Daubney, G. W. Lusby, F. A. Ritchie, J. B. Dowler.

FOR TRANSFER FROM THE CLASS OF STUDENT

BARACOS—ANDREW, of Winnipeg, Alta. Born at Calgary, on May 10, 1925. Educ.: B.Sc. Univ. of Alberta; M.Sc. (Civil), Alta., 1949; 1945, instru'man Dept. of Mines & Resources, Banff, Alta.; 1947-49, sessional instructor, Univ. of Alta.; 1948, summer, engr. Grade 1, Dept. of Mines and Resources, Jasper, Alta (St. 1947)

References: R. M. Hardy, I. F. Morrison, L. A. Thorssen, W. W. Peston, E. K. Cumming, W. F. Riddell.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL SALES ENGINEER required to work out of Montreal on sales and service principally in power plants. Business is well established and offers excellent opportunity for right man. Salary depends on experience. Bilingual desired but not essential. Apply to File No. 1301-V.

CIVIL

CIVIL ENGINEER with at least 2 years practical experience required by a large inter-municipal corporation in Western Canada. Under supervision and direction applicant must be able to assist and perform technical engineering work, prepare plans, perform field duties in connection with the construction and maintenance of simple structures, to install equipment and supervise and direct small groups of men. Salary $235.00 up. Apply to File No. 1144-V.

CIVIL ENGINEER able to administer and actively supervise all phases of townsite development and employee housing project, determine size and type of utilities, negotiate contracts, process mortgages with mortgage companies. Some experience in municipal affairs necessary. Salary $7,500 to $10,000 depending on experience. Location Alberta. Apply to File No. 1284-V.

CIVIL ENGINEER with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 1285-V.

CIVIL ENGINEER age 40 to 50 years required by Public Institution for Montreal area. Must have construction experience and be able to supervise large building program. Salary open. Apply to File No. 1286-V.

ELECTRICAL

SALES ENGINEER. Graduate electrical engineer. For large Canadian firm. Industrial electrical sales experience desirable. Location — Montreal. A permanent position with good future. Applicants should state previous experience and approximate salary expected. Apply to File No. 1299-V.

MECHANICAL

MECHANICAL ENGINEER preferably bilingual, about 35 years of age, for position of assistant to plant engineer in large industrial plant near Montreal. Position requires some knowledge of construction practices and ability to plan and supervise maintenance of industrial equipment. Good opportunity for advancement. Accommodation available. Apply to File No. 1288-V.

MECHANICAL ENGINEER required by a farm implement manufacturer in Ontario. Applicant should have experience in internal combustion engine or gear design. Salary open. Apply to File No. 1300-V.

SENIOR MECHANICAL ENGINEER required as sales manager by a tool and die manufacturer in Montreal. Applicant must have ability to handle general administrative duties including supervision of sales staff, also ability to discuss technical problems in connection with production tools and machines etc. A reasonable knowledge of metallurgy would be valuable. Salary open. Apply to File No. 1304-V.

MECHANICAL ENGINEER required in England by leading paperboard manufacturer. Age 25 to 35 years. Some experience in maintenance and development preferred. Excellent opportunity for future advancement. Applicant to furnish full particulars of qualifications and experience. Salary open. Apply to File No. 1305-V.

MISCELLANEOUS

CIVIL OR SANITARY ENGINEER with a number of years experience required by a large intermunicipal corporation in Western Canada. Must be able to assume responsibility in design, detailing, estimating, preparing specifications to layout and supervise the construction, repairs and maintenance of sewage collection system and treatment plant. Salary $325.00 per month up. Apply to File No. 1144-V.

SALES ENGINEER required by an electrical company in Montreal. Applicant should be 25 to 35 years with electrical background and some sales experience. Knowledge of French. Salary open. Apply to File No. 1283-V.

STRUCTURAL STEEL DRAUGHTSMEN AND CHECKERS, preferably graduate engineers are required for a steel fabricating company in Manitoba. Salaries open. Apply to File No.. 1285-V.

ASSISTANT PRODUCTION MANAGER, with considerable experience in the administrative field. Applicants should be able to accept responsibility and handle staff, also should be familiar with production methods, planning and scheduling of work in process, cost analysis and control, labour relations, etc. Salary $6,000 to $10,000. Apply to File No. 1287-V.

ASSISTANT PLANT MANAGER, with a general background in engineering but with considerable experience in the administrative field required for Canadian plants of an American firm. Applicants should be able to accept responsibility and handle staff. Salary $4,000 to $6,000. Apply to File No. 1287-V.

GRADUATE ENGINEER required by National Research Council to act as representative of the Technical Information Service, with headquarters in Toronto. Work involves personal interviews and plant inspection with officers of industrial firms. Excellent experience for those interested in technical sales work. Salary up to $4,300 per annum, depending upon training and experience. Apply to File No. 1289-V.

COMBUSTION ENGINEER required for industrial concern near Montreal to take full charge of large boiler house and steam turbo generators. Technical knowledge, extensive operating, experience and practical mechanical ability required. Permanent position and attractive salary. Apply to File No. 1290-V.

GRADUATE ENGINEER with considerable experience in mechanical equipment for buildings is wanted for work on heating, ventilating and air-conditioning by a firm of consulting engineers in Montreal. Salary open. Apply to File No. 1291-V.

GRADUATE ENGINEER wanted for Montreal suburb. Applicant will be required to supervise outside work and should have construction and municipal experience. Salary $300.00 to $350.00. Apply to File No. 1292-V.

TWO SALES ENGINEERS required in Eastern Canada by an old established firm. Construction or industrial sales experience along general civil lines desirable but not essential for experienced applicants. Must be willing to travel from headquarters in Toronto or Montreal Starting salary $200.00 to $300.00 per month depending on experience. All expenses paid. Bilingual ability desirable for Montreal position. Good prospects for early advancement. Apply to File No. 1302-V.

SALES ENGINEER required in Montreal. Preferably applicant with some experience in communication. Equipment handled will be all types of equipment associated with the re-production of sound. Salary open. Apply to File No. 1303-V.

GRADUATE ENGINEER required by mining and industrial machinery manufacturer in Ontario. Applicant must be experienced in the design of tools, jigs, fixtures, dies, molds, etc.; also capable of making own drawings and supervising draughtsmen in detailing work. Salary open. Apply to File No. 1306-V.

GRADUATE ENGINEERS AND DRAUGHTSMEN required by a large inter-municipal corporation in Western Canada proceeding very shortly with the enlargement of their sewage disposal plant. Work of temporary nature, lasting at least six months. Salaries open. Apply to File No. 1307-V.

GRADUATE ENGINEER primarily electrical background required for sale of electrical and allied machinery and to open branch office in Calgary. Must have at least two years selling experience. Salary open. Apply to File No 1308-V.

ASSISTANT SUPERINTENDENT required in Windsor, N.S. Applicants must be graduate electrical engineers with wide experience in the operation and maintenance of hydro-electric generating stations, substations, transmisison and overhead distribution. Opportunity for promotion to superintendent after satisfactory service. Salary $425.00 per month. Apply to File No. 1309-V.

TECHNICAL ASSISTANT required in Halifax, N.S. Applicants must be graduate engineers with wide mechanical and electrical experience in the construction, operation and maintenance of modern steam generating stations. Applications should be forwarded not later than Dec. 15, 1949. Salary $475.00 per month. Apply to File No. 1309-V.

SALES ENGINEER required in Ontario. Preferably applicant with experience in the heading and ventilating field, or alternatively, refrigeration. Age 25-35 years. Mainly Toronto area but some time spent each month in Montreal area. Salary open. Apply to File No. 1310-V.

TOOL AND DIE DESIGNER, wanted by well established Ontario Range Manufacturer, to head tool engineering division. Must have practical experience in operations and tools and materials used in stove and furnace manufacture and the ability to establish modern methods of operational procedures. Apply to File No. 1311-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, recent Ph.D. or equivalent with good background in organic chemistry preferably along the lines of wood and cellulose chemistry and fuels technology. Applicant needs capacity for contacting paint personnel and appreciation of engineer phases of problems. Position in British Columbia. Salary open. Apply to File No. 1118-V.

CHEMICAL ENGINEER required as sales engineer by large diversified chemical company in Montreal. Applicants should have sales experience and ability to sell to senior executives. Knowledge of paint industry helpful. Age 30 to 40 years, preferably bilingual. Location Montreal. Salary commensurate with qualifications. Apply to File No. 1239-V.

CHEMICAL ENGINEER OR HONORS CHEMISTRY, recent graduate (1948-1949) required by a metallurgical and chemical company in Western Canada. Salary open. Apply to File No. 1271-V.

CHEMIST required for processed food plant in Montreal. Must be responsible for control of quality and developing process for solving formula problems due to variations in raw materials and methods of manufacture. Ability to write clear, concise reports is essential. Salary open. Apply to File No. 1275-V.

ELECTRICAL

ELECTRONIC ENGINEER, fully qualified. At least five years laboratory experience in circuit design and radio physics. Salary open. Apply to File No. 1243-V.

SUPERINTENDENT for electronics laboratory required by Defence Research Board. Applicant should have post graduate training to Ph.D. level or equivalent also considerable experience in directing research groups in communications, radar, radio and servomechanisms. Applicant must be a British subject. Apply to File No. 1249-V.

RECENT GRADUATE in electrical engineering required as assistant supervisor of distibution. Duties would be under supervision. Location Ontario Salary open. Apply to File No. 1253-V.

GRADUATES IN ELECTRICAL ENGINEERING OR PHYSICS required in an expanding research and development laboratory in Montreal. Applicant must have at least 3 years design and manufacturing experience on radio transmitters or radar equipment. Salary open. Apply to File No. 1262-V.

ENGINEER OR PHYSICIST required by Canada's leading manufacturer of radio and electronic equipment. Preferably applicant with post-graduate degree, at least five years experience advanced development or research on electrical circuits. Pulse experience preferred. Able to plan and direct an engineering group. Location Montreal. Salary open. Apply to File No. 1262-V.

SENIOR ELECTRICAL ENGINEER required with 5-10 years experience for a large mining company in Quebec. Must be able to do layout and estimating for distribution and installation of electrical equipment on a large scale, previous experience in underground and open pit mines mill and factory. House available for a married man. Salary open. Apply to File No. 1266-V.

ELECTRICAL ENGINEER, bilingual, required by a large firm in Montreal, for supervision of electric meter repair and testing, also testing of electrical equipment (transformers, switches, etc.). Age 28 to 35 years. Must have completed test course with either General Electric or Westinghouse Company and have five years previous experience in supervision. Salary open. Apply to File No. 1270-V.

ELECTRICAL ENGINEER, recent graduate, preferably with some experience in electronics required to work on electrical maintenance of a large printing plant in Montreal. The work will include electrical layout, organization of maintenance of electrical and electronic controls on large printing presses and the installation of new equipment. Salary open. Apply to File No. 1277-V.

MECHANICAL

MECHANICAL ENGINEERS required by Montreal firm manufacturing roofing products etc. for training period. Salary open. Apply to File No. 1233-V.

MECHANICAL ENGINEER with ten to fifteen years experience required in Montreal. Applicant would be responsible for engineering problems throughout firms, Canadian division, Halifax to the west coast. Directly supervise maintenance crew in major production plant. Location Montreal. Salary open. Apply to File No. 1241-V.

MECHANICAL ENGINEERS AND DESIGNERS. Fully qualified. Accustomed to working with small electromechanical device. Location Ontario. Salary open. Apply to File No. 1243-V.

MECHANICAL ENGINEER 35 to 45 years of age with knowledge of plumbing, heating and air-conditioning required in Ontario. Duties would be estimating, layout and design with some supervisory and management duties. Salary from $200 to $350 to start. Apply to File No. 1247-V.

MECHANICAL ENGINEER required for layout and design of plumbing and heating equipment. Location Montreal. Salary open. Apply to File No. 1252-V.

MECHANICAL ENGINEER required for Toronto office of a firm of power house and dust collection specialties. Applicant should have experience in supervision and construction. Salary open. Apply to File No. 1258-V.

GRADUATE IN MECHANICAL ENGINEERING required by Canada's leading manufacturer of radio and electronic equipment in their research and development laboratory in Montreal. Applicant must have at least three years experience in mechanical design of radio transmitting or similar electrical equipment. Salary open. Apply to File No. 1262-V.

MECHANICAL ENGINEERS required in Ontario. The qualifications for the more senior of these positions are those of a person of considerable experience on machines as found in the Tool Engineering Department of the Automotive Industry. The other position requires the qualifications of a body layout engineer. Experience preferably obtained with the Automotive Industry. Salaries open. Apply to File No. 1268-V.

MECHANICAL ENGINEER, recent graduate required for sales engineering. Location Montreal. Salary open. Apply to File No. 1274-V.

METALLURGICAL

PHYSICAL METALLURGIST AND FOUNDRY METALLURGIST required in British Columbia. Applicant for former position must have broad background in physical metallurgy, including heat treating problems, corrosion problems, studies of failures in metals etc. Salaries open. Apply to File No. 1118-V.

MINING

MINING ENGINEERS required by a large company in the Province of Quebec. Two men with 2-5 years experience, must be able to do layouts. One with ten years experience in both underground and open pit mine operations. One with experience as mine safety director with two assistants. Houses available for married men. Salaries open. Apply to File No. 1266-V.

MISCELLANEOUS

ARE YOU A KEEN TYPE? Can you discuss technical problems at a high level? Have you a car with which you could cover the Province of Quebec to sell air filtration and silencing equipment for a British manufacturer who believes that the prospects are unlimited for the right man. It will be better if you are bilingual and thoroughly familiar with all types of prime movers and power equipment. If you believe you can meet exacting standards send complete details to File No. 1229-V.

DESIGN ENGINEER required for development work on aircraft cabin supercharging and air conditioning equipment. Location Montreal. Salary open. Apply to File No. 1230-V.

GRADUATE ENGINEERS with considerable experience on generating and substation planning and design. Required by public utility in Ontario for coordinating and planning several projects. Salary open. Apply to File No. 1235-V.

SALES ENGINEER required by prominent distributor of heavy equipment for forestry, road building and construction industries. Head Office in Montreal. Working knowledge of French and executive ability necessary. Salary open. Apply to File No. 1237-V.

SENIOR STRUCTURAL ENGINEER required in Montreal. Must have extensive experience in both field work and design. Estimating experience would be valuable. Salary according to qualifications. Apply to File No. 1242-V.

FIELD ENGINEER required for Montreal area for concrete and steel structure. Would also be responsible for line and grade work on job, also technical supervision of the work. Salary open. Apply to File No. 1242-V.

MECHANICAL OR ELECTRICAL ENGINEER required for Junior position in production engineering division. Preferably applicant with interest in hydraulics as applied to machine tools. Location Ontario. Salary $270.00 to $325.00 per month. Apply to File No. 1244-V.

INSTRUCTOR qualified to teach elementary physics required for staff of a technical college in New York State. Preferably applicant with a masters degree in physics or equivalent training and some teaching experience. Salary open. Apply to File No. 1257-V.

RECENT GRADUATE, required in Montreal. Duties include draughting, building, and piping layouts. Preferably civil background. Salary open. Apply to File No. 1259-V.

SALES ENGINEER, around 30 years of age, preferably electrical background and experience with a utility or an electrical contractor or consulting firm. Should be familiar with transmission and distribution practice. Working knowledge of French. Location Montreal. Salary open. Apply to File No. 1261-V.

ASSISTANT TO GENERAL MANAGER

GRADUATE ENGINEER (or equal qualifications) preferably Civil or Mechanical for position of Assistant to General Manager of steel company, leading as soon as possible to job as Works Manager. Salary is open, but should not present any obstacle if applicant has necessary qualifications.

The Company is located in the Maritimes and operates a steel foundry, structural and machine shops at one location. Employs approximately three hundred men. Future of Company appears good. Applicants who are of interest to us will be furnished with more details of Company's position.

In applying for position give complete details and state salary required.

Main characteristic looked for in applicant is organizational ability with aggressiveness.

Experience is important and a minimum amount is required, but intelligence and the ability to learn quickly are essential.

Apply to File No. 1313-V.

TECHNICAL WRITER, graduate in engineering or science required by manufacturer of radio and electronic equipment in Montreal. Should have at least two years experience in writing instruction books for complex radio, radar or similar electrical equipment. Salary open. Apply to File No. 1262-V.

GRADUATE ENGINEER with specialized training in trolley coach maintenance required by an Eastern Canadian public utility. State age, experience and qualifications in first letter. Salary open. Apply to File No. 1263-V.

STRESS ANALYSTS required by research and development engineers in England. Vacancies for both senior and junior man. Should have experience of stress analysis and allied problems for aircraft structures. Senior man's duties would be partly research. Apply to File No. 1264-V.

BUILDING INSPECTOR required by city in Western Canada. Duties would involve the operation of a department caring for the approval of designs, plans, proposed construction, the carrying out of certain design work, also the operation of the department covering maintenance of the city buildings. Applicant must have ability to deal with public. Salary open. Apply to File No. 1265-V.

RECENT GRADUATE wanted immediately for time study work with a large mining company in Quebec. Preference given to bilingual persons with experience in this type of work. Salary open. Apply to File No. 1266-V.

MECHANICAL OR MINING ENGINEERS required by a large mining company in Quebec. One senior industrial engineer with experience in incentive wage negotiations, methods study, etc. Vacancies for general mill foreman with previous experience in ore-crushing, screening and mill production. Salary open. Apply to File No. 1266-V.

SALES ENGINEER required in Montreal with mechanical engineering training. Preferably applicant with some selling experience. The lines which he would have to handle would be contractors, road-building and industrial equipment as well as pumps of various types. Age 30-35 years with working knowledge of French. Salary open. Apply to File. No. 1267-V.

GRADUATE ENGINEER for estimating required by well established steel fabrication company in Manitoba. Preference will be given to anyone having experience in estimating structural and plate fabrication-miscellaneous, ironwork and general machinery items. Applicants should state age, experience and salary expected. Apply to File No. 1272-V.

SENIOR INDUSTRIAL ENGINEERS required in Montreal. Applicants must be thoroughly experienced in production control, wage incentives and cost control and must be bilingual. Salary open. Apply to File No. 1276-V.

SALES ENGINEER with experience in sheet metal work, especially as applied to food service equipment for hospitals, hotels, etc., to design layouts and do contact work for firm already well established in this line. Salary and bonus system to competent man will ensure excellent income. Apply to File No. 1279-V.

SALES ENGINEERS ,graduates in mechanical engineering. Experience in refrigeration desirable. To act as company representative on territories, contacting dealers and assisting them in sales and service, by manufacturer of refrigerated equipment. Starting salary $3,000.00 to $3,600.00 per year plus expenses. Men required for Hamilton. Winnipeg, Edmonton and Vancouver. Apply to File No. 1279-V.

Situations Wanted

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., University of Saskatchewan, 1941, age 31. Experience in mechanical inspection, production draughting, checking, mechanical design. Familiar with shop methods, working knowledge of work simplification. Desire change as opportunity for advancement limited. Willing to learn and will consider any type of work with reliable concern. Not adverse to travel. Available upon 4 weeks notice. Apply to File No. 41-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., requires a part time position in the city of Hamilton with a consultant of reinforced concrete and structural steel. Interested in designing, checking or draughting. Will be available evenings and week-ends. Apply to File No. 43-W.

ELECTRICAL AND MECHANICAL ENGINEER, graduate of Australian University B.E. (Hons.) A.M.I.E. (Aust.). 27 years. Single. 6 years experience including electrical design on layout, illumination, auxiliary plant, mechanical design, maintenance, supervision and production. Seeking experience and possible opportunity for post-graduate study over period of 5 years or more. Apply to File No. 59-W.

MECHANICAL ENGINEERING GRADUATE 1947, Jr.E.I.C., 4 years varied experience which includes: instrument man on dam construction and city engineering; power plant operation; substation construction and maintenance; instrumentation and maintenance engineer in chemical plant. Apply to File No. 60-W.

ELECTRICAL ENGINEER, S.E.I.C., A.I.E.E., B.Sc. in E.E. (Power Option). University of New Brunswick, 1949. Service with R.C.A.F. 3 years as aircraft electrician. Summers work with Northern Electric as dial installer. Age 26, single, bilingual. Desires work in power or sales. Available now. Will work anywhere. Apply to File No. 79-W.

ELECTRICAL ENGINEER, Associate I.E.E. Age 52. Married. 5 years pupil in English plant. 15 years supervising estimating and technical correspondence department of leading English manufacturers of power transformers and capacitors. 5 years with manufacturers' association. Library, technical writing and advertising experience. Presently located in Southern Ontario. Apply to File No. 81-W.

GRADUATE ELECTRICAL ENGINEER AND LAWYER, B.Eng. 1937, McGill, B.C.L. 1949, McGill, M.E.I.C. Age 35. Married. Ten years service with national electrical concern as sales engineer. Three years in R.C.A.F., as aeronautical engineer. Also took R.C.A.F. signals course. Position desired in industrial concern, preferably in administrative capacity where engineering experience and legal background would be an asset. Location immaterial. Available immediately. Apply to File No. 120-W.

ELECTRICAL ENGINEER, S.E.I.C., B.Sc. Alberta 1949. Age 29. Single. Desires employment in electronic field, would consider power field. 4½ years experience R.C.A.F. radar mechanic, 18 months, repair and assembly in radar factory. Available after September 15th. Apply to File No. 137-W.

GRADUATE, Institution of Mech. Engineers, Ex-Captain REME, B.Sc. Tech. (Manchester) two years works experience, 26, arriving Canada end of November, desires suitable employment on production side. Apply to File No. 189-W.

MECHANICAL ENGINEER, M.E.I.C. P.Eng. (Registered in Ontario and Quebec) age 50. Seeks technical representations, on salary or commission, in Ottawa or Eastern Canada. Specialties, light manufacturing and research projects. Apply to File No. 199-W.

GRADUATE CIVIL ENGINEER, University of Sask. 1949, S.E.I.C., age 25, veteran. Desires employment in hydraulic or structural engineering field. Experience in concrete construction, hydraulic development and general survey work during successive summers. Apply to File No. 203-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., Queen's 1948, age 23, single. One summer of railroad surveying. One summer on government topographical survey. Presently employed as transitman on highway location survey in Yukon. Desire work in hydraulic engineering, with pulp and paper company or in general construction, in Ontario or Quebec. Apply to File No. 204-W.

ELECTRICAL ENGINEERING ASSISTANT, A.M.I.B.E., English, 31 years of age, married, one child, proposes to emigrate Ontario Spring 1950. At present employed by the Air Ministry at London Airport in drawing office. 6 years Royal Air Force, 2 years working on construction of diesel power station. Would prefer position with airfield construction contractors or with public utility company in town or country. Apply to File No. 206-W.

MECHANICAL ENGINEERING GRADUATE, B.E., S.E.I.C., University of Saskatchewan, 1949. Age 23. Single. Desires junior engineering or supervisory position in farm implement field. Diversified experience in operating and maintenance. Interested in development, sales or design. Energetic, reliable, with desire for an opportunity to train for responsible position rather than salary. Ability to make friends and get things done. Available in near future. Foreign or Domestic. Apply to File No. 240-W.

GRADUATE of Engineering and Business, S.E.I.C., Toronto 1949. B.A.Sc. (Honours). Age 24. Some experience in both craft and fine paper mills. Prefers a position within the paper industry, but will consider any branch of engineering. Available immediately. Apply to File No. 242-W.

CHEMICAL ENGINEER, Jr.E.I.C., P.Eng., B.Sc. MSc. 1947. Age 26, single, free to travel. Three years varied industrial experience in inorganic and organic chemical manufacture. Have development, production, and pilot plant experience. Co-operative, resourceful and adaptable to all phases of the chemical industry. Desires permanent position, requiring initiative, with good future prospects. Apply to File No. 249-W.

GRADUATE CIVIL AND SANITARY ENGINEER, S.E.I.C., Recorded P.Eng. B.Sc. Queen's 1948, M.A.Sc. Toronto 1949; age 25, single; have held the following positions: instrumentman on highway construction; assistant engineer on hydrographic survey; at present, assistant town engineer with experience in design of sewers and watermains, laying of concrete sidewalks, and also in design of reinforced concrete box culverts; seeking employment in a larger centre, preferably with a consulting engineer. Apply to File No. 250-W.

CIVIL ENGINEER AND ARCHITECT. B.Eng., 1943 at McGill. Graduating in architecture at McGill, May of 1950. Junior member E.I.C. Age 28. Married. Ex-R.C.A.F. officer aircrew. Main interest is town planning and municipal work. Would like to discuss a future. Apply to File No. 252-W.

MINING ENGINEER; M.E.I.C., P.Eng. McGill 1940. Married. Age 32, bilingual, with past experience covering engineering in layout, designing, estimating, planning and operating of underground and open pit mines desires suitable change with greater responsibility. Apply to File No. 256-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Eng., 1945, age 26, single. Four years varied experience switchgear, distribution systems, maintenance, inspection, costs, etc. Desire position in Montreal area but willing to travel. Apply to File No. 658-W.

FIRE PREVENTION ENGINEER, graduate McGill 1936, M.E.I.C., P.Eng. (Que.) with 13 years experience in fire prevention, safety and administrative work covering a wide variety of industrial operations. Work in production-management or maintenance line preferred. Will locate anywhere in Canada. Apply to File No. 1494-W.

MECHANICAL GRADUATE, M.E.I.C., P.Eng., age 42 with experience in mechanical design and plant maintenance, nine years as an industrial loss prevention engineer, desires permanent connection with senior responsibility. Ontario location preferred. Apply to File No. 1543-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C. Background of engineering: production, business organization, cost control and management. Age 36, 10 years experience, married, bilingual. Would prefer permanent association with firm in Montreal area. Would consider association with fellow engineer to start in manufacturing or other sphere of activity. Some capital available and a few projects in mind. Apply to File No. 1782-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. (Ont.) Married. Presently employed. Seven years experience in Canada and the United States designing and supervising the installation and operation of heating, ventilating, air conditioning, refrigeration and dust collecting systems. Desires to improve position. Prefer Southern Ontario or Western Canada. Apply to File No. 2172-W.

MECHANICAL ENGINEER, M.E.I.C. Age 31, married. 8 years engineer officer R.C.N. including cruiser operation, overseeing new construction, instructing engineering graduates. Assistant superintendent in shipyard. Operation diesel generator stations. Interested in practical construction, operation, maintenance, manufacturing methods. Prefer B.C. or Alberta areas. Apply to File No. 2539-W.

ENGINEERING GRADUATE, M.E.I.C., B.A., M.Sc. Married. Age 52, bilingual. Experience: 13 years teaching chemistry, mineralogy, geology, 9 years as mineralogist. Contemplates change soon for association with mining organizations in consulting capacity. Please submit propositions to File No. 2663-W.

MECHANICAL ENGINEER, Jr.E.I.C., Sask. '46. Age 24. Married, one child. Over two years experience in pulp and paper mill engineering, including design, supervision of construction, and executive reports. Available on two months notice for any interesting job which offers good experience and advancement according to merit. Will give serious consideration to any type of work except sales. Location unimportant. Apply to File No. 2795-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Alberta, 34 years of age, married. veteran R.C.E. Have held the following positions, instrumentman on airport construction, road and concrete materials assayer and inspector, superintendent on road construction programme, assistant engineer in design office dealing in building design, timber, concrete and steel, superintendent in complete charge of building project. Wish to contact contractor (preferably in building construction) or consultant firm in Western Provinces. Available on reasonable notice. Apply to File No. 2875-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng. '44, age 28, bilingual. Experience as follows: Demonstrator in Department of Mechanical Engineering at leading university for one term. Also experience in large mass production outfit in following departments: Cast iron foundry, dry milling cast iron, oil milling, punch and die, screw, heat treating, forge, polishing, nickel and chrome, paint spray, assembly, tool room and production engineering department, etc. Prefers work on design and development of mass production industrial automatic machinery or any other interesting opportunities. Available after October 1. Apply to File No. 2382-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44, 7 years industrial experience, production supervision, planning, scheduling, specifications, incentive systems, methods, estimating, cost analysis, business experience, welding application and metallurgy, manufacture of equipment for chemical production industry. Desire position technical representative, sales, executive assistant, production manager. Available 3 to 4 weeks. Apply to File No. 2920-W.

MECHANICAL ENGINEER graduate 1944, Jr.E.I.C., P.Eng. Ont. Experienced in production and material control, industrial engineering design and plant engineering. Past experience in building products, basic steel and foundry and implement manufacturing. Employed, age 29, married. Desires position in progressive organizations. Apply to File No. 2955-W.

GRADUATE DRAUGHTSMAN, DESIGNER, S.E.I.C., B.Eng. Desires a position in the structural design field, preferably reinforced concrete detailing and design. Age 23, McGill (Civil) graduate '48. More than a year's experience in structural steel and reinforced concrete detailing and design. Prefer employment in Montreal area, will consider good position elsewhere. Presently employed. Available on short notice. Apply to File No. 3026-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. (Quebec). Large experience in plant maintenance, production planning and machinery design. Good theoretical background. Excellent references from former employers. Seeking a responsible position in Montreal. Available on short notice. Apply to File No. 3045-W.

SALES ENGINEER, chemical engineer graduate, S.E.I.C. Laval '48. B.A.Sc P.Eng. Age 25, single, bilingual. Desirous of obtaining a position as sales engineer, preferably in the Province of Quebec for a chemical or heating and ventilating firm. Available immediately. Apply to File No. 3064-W.

ELECTRICAL ENGINEER, Jr.E.I.C. 2½ years technical officer in Army, 3 years varied industrial experience, including production planning and control, work simplification, and cost accounting. Courses completed in business administration. Interested in sales work. Desires position with small or medium size company. Apply to File No. 3181-W

MECHANICAL GRADUATE, age 24, Jr.E.I.C., P.Eng. Q., Queen's 1947. Two years experience as a maintenance engineer with large Montreal industrial firm. Engaged in general plant and machinery maintenance work, including co-ordination of the work of draughtsmen, machinist and other trades. Evening student in commerce and sociology courses. Navy veteran. Desires maintenance or sales work with another Montreal industrial firm. Apply to File No. 3208-W.

MECHANICAL ENGINEER, B.Sc. Graduate. I.M.E., 2 years engineer officer; one year and a half steam turbine research. Anxious to obtain suitable position in Canada in research, design or teaching fields. Available immediately. Apply to File No. 3229-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

City of Prince Albert

REQUIRES ASSISTANT CITY ENGINEER

JANUARY 1, 1950

Duties will be General Municipal Engineering, including operation of the pumping and purification plant; cleansing and water delivery branch; asphalt plant, also maintenance and construction of street paving, concrete curbs, sidewalks, sewer and water mains, also Building Inspection.

Starting salary will be $225.00 to $275.00 per month.

Applications giving *full* particulars to be addressed to the undersigned City Hall, Prince Albert, Saskatchewan.

J. JONSSON, City Engineer.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

Elementary Structural Problems in Steel and Timber

By C. R. Young and C. F. Morrison, 3d ed. Wiley, New York; Chapman. London, 1949. 329 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.50.

Reviewed by R. E. Jamieson.*

Students of structural design will welcome this latest edition of the authors' well-known collection of problems. The general plan of the earlier editions has been followed, and the student will find a very wide range of examples of design problems fully analysed and worked out in detail. The portions relating to steel structures have been revised in line with trends in recent specifications and have been expanded. The chapters on timber structures have been completely re-written, and now present data on the most modern methods of timber detailing, including the use of ring-connectors. Especially useful are the tables of values of connection elements under different specifications. This new material on timber problems will prove a very useful addition to the book.

As the authors state in their foreword, this book is for the man who wishes to test his knowledge of design theory by the solution of specific problems. The lists of problems presented for solution are most comprehensive, and answers are given throughout. The student who completes a reasonable selection of them is entitled to feel that his grasp of fundamental theory and his knowledge of pertinent specifications have been checked and found satisfactory.

**Chairman, Dept. of Civil Engineering, McGill University, Montreal, Canada.*

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Acid Making in the Sulphite Pulp Industry:
A. H. Lundberg. Watertown, N.Y., G. D. Jenssen Co., c1949, illus., cloth.

Advanced Organic Chemistry; 2d ed:
G. W. Wheland. New York, Wiley; London, Chapman, c1949. 799 pp., illus., cloth.

Basic Electronics:
Royce Gerald Kloeffler and Maurice Wilson Horrell. New York, Wiley; London, Chapman, 1949. 435 pp., illus., cloth.

Canadian Steel Construction; Part 1, Canadian Mill Sizes. Part 2, Composite Construction Tables:
Canadian Institute of Steel Construction. Toronto, the Institute, 1947. 160 pp., illus., paper.

Great Lakes—St. Lawrence Deep Waterway:
Ottawa, Department of Transport, General Engineering Branch, 1949. 31 pp., illus., paper.
...French Edition.

Five—Figure Tables of Mathematical Functions:
John Borthwick Dale. London, Arnold, 1945. 92 pp., cloth.

Conquest of Space:
Willy Ley. N.Y., Viking Pr., Toronto, Macmillan, 1949. 160 pp., illus., paper.

History of Chemistry in Canada:
C. J. S. Warrington and R. V. V. Nichols. Toronto, Pitman, 1949. 502 pp., illus., cloth.

History of the Development of Building Construction in Chicago:
Frank A. Randall. Urbana, University of Illinois Pr., 1949. 388 pp., illus., cloth.

Industrial Minerals and Rocks; 2d ed:
N.Y., American Institute of Mining and Metallurgical Engineers, 1949. 1156 pp., illus., cloth.

Light Metals Industry:
Winifred Lewis. London, Temple Pr., 1949. 397 pp., illus., cloth.

Radio and Television Mathematics:
Bernhard Fisher. N.Y., MacMillan, 1949. 484 pp., illus., cloth.

Steel Construction; 5th ed:
N.Y., American Institute of Steel Construction, 1948. 432 pp., illus., paper.

Technical Sketching and Visualization for Engineers:
Hyman H. Katz. N.Y., MacMillan, 1949. 163 pp., illus., cloth.

Tool Engineers Handbook:
American Society of Tool Engineers, N.Y., Toronto, McGraw-Hill, 1949. 2070 pp., illus., cloth.

University Physics:
Francis Weston Sears and Mark W. Zemansky. Cambridge, Mass., Addison-Wesley, 1949. 848 pp., illus., cloth.

ANNUALS

Britannica Book of the Year: events of 1948:
Encyclopedia Britannica Inc., Toronto, 1949.

British Engineers' Association:
Classified Handbook of Members and their Manufacturers. 1949.

Comité International de l'Organisation scientifique:
Annuaire. 1949.

Daily Commercial News:
Daily Commercial News and Building Record Annual Fall Roads Issue, 1949.

Connecticut Society of Civil Engineers:
65th Annual Report, 1949.

Engineering Industries Association:
Classified Directory, 1949.

STANDARDS

British Standards Institution:
Code of Practice—CP(B) 894—Patent Glazing.—CP(B) 895—Painting Iron and Steel.

Canadian Standards Association:
Standard for Unified and American Screw threads. CSA B1.1 1949.

U.S. National Bureau of Standards:
Unified Screw Thread Standards. NBS Circular 479.

American Welding Society:
Proposed Recommended Practices for Metallizing.

PAMPHLETS, ETC.

American Practice in Dam Design and Construction:
Milton G. Speedie, State Rivers and Water Supply Commission, Victoria, 1949.

Copper as a Fertilizer Amendment for Tobacco and Other Crops:
Frank A. Gilbert, Battelle Memorial Institute, Columbus, Ohio.

LIBRARY REGULATIONS

Hours

	Oct.-Apr.	May-Sept.
Mon.-Fri.	9- 6	9- 5
Thurs. (Oct.-Mar.)	9- 8	9- 5
Sat. (closed Jy.-Sept.)	9-12	9-12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members. and $2.50 to non-members.

Indicate which required
Be specific

Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

Non-members may consult the library, but may not borrow material.

Laboratories for Research and Development:
Franklin Institute of the State of Pennsylvania, Phila., c 1949.

Magnetic Heating of Transmission Line Clamps:
V. L. Crabb and J. M. Sheadel, Ohio Brass Co., 1949.

Multitubular and Locomotive Boiler Defects and Repairs:
Sydney D. Scorer, London, John D. Troup, 1949.

Municipal Regulation of Parking Lots:
Charles S. LeCraw and Wilbur S. Smith, Eno Foundation for Highway Traffic Control, Saugatuck, Conn., 1949.

Permafrost; a Digest of Current Information:
Directorate of Engineer Development, Army Headquarters, Ottawa, 1949.

Pour une Politique d'Urbanisme:
Service Extérieur d'Education Sociale, Université Laval, Québec.

Tables of Conversion Factors Weights and Measures:
J. A. M. Gaboury, Montreal, 1949.

TECHNICAL BULLETINS, ETC.

California Institute of Technology. Industrial Relations Section:

Bulletin No. 16—*Trends in Industrial Relations.*

...**Circular No. 17**—*Handling Complaints and Grievances. Waldo E. Fisher.*

Edison Electric Institute. Publications:
A-C Network Operations: 1944-1946. (*Pub. No. Q-12*)—*Turbines, Condensers and auxiliaries, Feedwater Heaters and Evaporators, 1946-1947.* (*Pub. No. R-3*).

Eno Foundation for Highway Traffic Control:
Municipal Regulation of Parking Lots. Charles S. LeCraw, Jr. and Wilbur S. Smith.

Harvard University. Publications from the Graduate School of Engineering:
No. 467—Soil Mechanics in the Design and Construction of the Logan Airport, A. Casagrande.—No. 468—Graphical Determination of Transfer Function Loci for Servomechanism Components and Systems, C. H. Thomas and E. C. Easton.—No. 469—Kinetic Studies on the Chloramine 1, the Rate of Formation of Monochloramine, N—Chlormethylamine and N—Chlordimethylamine, Ira Weil and J. Carrall Morris.—No. 470—Identities in the Theory of Conformal Mapping, P. R. Garabedian and M. Shiffer.

Institution of Mechanical Engineers. Automobile Division:
Propeller Shaft of Hooke's Coupling and the Cardan Joint. H. I. F. Evernden.

International Civil Aviation Organization. Documents:
6716—AT/691—Preliminary Study of Payment for the use of Airway Facilities. 6736-C/775 Proceedings of the Second Assembly.

Mechanical World Monographs:
No. 53—Industrial Grinding and Reduction Plant. C. S. Darling.

Ohio State University. Engineering Experiment Station:
No. 137—Behavior of vitrified Clay Sewer Pipe under Load. J. O. Everhart.

PUBLICATIONS OF OTHER ENGINEERING SOCIETIES

Exchange arrangements exist between The Engineering Institute of Canada and engineering societies in the British Empire and the United States whereby members of the Institute may secure the publications of these societies at special rates, which, in most instances, are the same as charged to their own members. A list of these publications with the amounts charged (not including bank charges and exchange) is given below. Subscriptions should be placed at E.I.C. Library, 2050 Mansfield St., Montreal 2, Que., but no remittance should be made until an invoice has been received. These prices are subject to change without notice.

	Rate to E.I.C. Members	*Rate to Non-Members*
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS		
Electrical Engineering—monthly, single copies	$ .75	$ 1.50
Per year (Plus postage to Canada 50c)	6.00	12.00
Transactions—annual, bound (Plus postage to Canada 50c)	6.00	12.00
Combined subscription (Plus postage to Canada $1.00)	8.00	16.00
AMERICAN SOCIETY OF CIVIL ENGINEERS		
Proceedings—monthly, single copies	$ .50	$ 1.00
Per year (Plus foreign postage 75c)	4.00*	8.00†
Civil Engineering—monthly, single copies	.50	.50
Per year (Plus 75c postage to Canada, elsewhere $1.50)	4.00	5.00
Transactions—annual, per year	6.00‡	12.00¶
(Other publications 50% reduction on catalogue price to E.I.C. members)		

* *If subscription received before Dec. 1st, otherwise $5.00*
† *If subscription received before Dec. 1st, otherwise $10.00*
‡ *If subscription received before Jan. 1st, otherwise $ 8.00*
¶ *If subscription received before Jan. 1st, otherwise $16.00*

AMERICAN SOCIETY OF MECHANICAL ENGINEERS		
Mechanical Engineering—monthly, single copies	$ .50	$ .75
Per year (Plus 75c postage to Canada, elsewhere $1.50)	4.00	7.00
Transactions—annual, bound, about March 1st (current volume)	10.00	15.00
Journal of Applied Mechanics—quarterly (Plus 25c postage)	4.00	5.00
Applied Mechanics Reviews—monthly, per year	9.00	12.50
(Other publications, same rate to E.I.C. members as to A.S.M.E. members)		
INSTITUTION OF CIVIL ENGINEERS		
Journal—8 issues, monthly, Oct.-May single copies (post free)	3s–6d	5s–0d
Per year (post free)	28s–0d	£2– 0s–0d
INSTITUTION OF ELECTRICAL ENGINEERS		
Proceedings—three parts, per year	£1–16s–9d	£3–13s–6d
Part I—General—bi-monthly, per year	10s–6d	£1– 1s–0d
Part II—Power Engineering—bi-monthly, per year	15s–9d	£1–11s–6d
Part III—Communications Engineering—bi-monthly, per year	15s–9d	£1–11s–6d
Science Abstracts—two sections, per year	£1–10s–0d	£3– 0s–0d
Section A—Physics Abstracts, per year	17s–6d	£1–15s–0d
Section B—Electrical Engineering, per year	17s–6d	£1–15s–0d
INSTITUTION OF ENGINEERS, AUSTRALIA		
Journal—monthly, per year	£2– 2s–0d	£4– 4s–0d
INSTITUTION OF ENGINEERS (INDIA)		
Journal—quarterly, single copies	3s–0d	4s–5d
Per year	12s–0d	18s–0d
INSTITUTION OF MECHANICAL ENGINEERS		
Proceedings—quarterly, per year	£3– 0s–0d	£4– 0s–0d
NEW ZEALAND INSTITUTION OF ENGINEERS		
Proceedings—annual, bound	10s–6d	£1– 1s–0d
SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS		
Transactions—monthly, single copies	2s–6d	3s–6d

Ontario. Department of Mines. Bulletin:
No. 25—List of Publications.

Princeton University. Industrial Relations Section. Research Report Series:
No. 79—Transmitting Information through Management and Union Channels. Helen Baker and others.

Refrigerating Engineering Application Data:
No. 47—Refrigeration Controls. William P. Meyers, Jr.

Toronto City Planning Board:
Third Report and Official Plan. 1949.

U.S. Department of the Interior. Geological Survey Bulletin:
No. 958—Bibliography of North American Geology, 1946 and 1947. No. 996-A—Geophysical Abstracts 136 January-March, 1949.

...**Highway Research Board. Bibliographies:**
Bib. No. 2 Sup. No. 1—Selected Bibliography on Highway Safety.—Bib. No. 7 Bibliography on Prestressing and Precasting Reinforced Concrete for Use in Highway Bridges and Structures.

...**Highway Research Board. Bulletin:**
No. 20—Pavement Performance.

U.S. National Bureau of Standards.

Building Materials and Structures Report:
No. BMS115—Study of a Baseboard Convector Heating System in a Test Bungalow.—No. BMS116—Preparation and Revision of Building Codes.

BOOK NOTES

The institute does not assume responsibility for any statements made; these are taken from the preface or the text of the book.

Prepared by the Library of The Engineering Institute of Canada.

BRITISH STANDARDS INSTITUTION. STANDARDS:

B.S. 1541:1949—Rolled Brass and Naval Brass Condenser Tube Plates.

Gives the chemical compositions for both types, covers dimensions and weight of plates, and includes requirements for provision of test samples and details of making tensile and bend tests.

B.S. 1549, Part 1:1949—Methods for Sheet Metal Pattern Development. 3/-.

Deals with assemblies in which, by reason of size, simplicity of outline, or thinness of material, the neutral line may safely be ignored. Includes development for single curvature work by Radial Line, Parallel Line and Triangulation.

B.S. 1552:1949—Control Cocks for Low Pressure Gas. 2/-.

Deals with control plug cocks of copper base alloy with nominal sizes ½ inch to 2 inches B.S. pipe thread used mainly for meters for low pressure gas.

CANADA YEAR BOOK, 1948-49.

Dominion Bureau of Statistics, Ottawa, King's Printer, 1949. 1267 pp., illus., 9 x 6½ in., cloth, $2.60.

The Canada Year Book is the "official statistical annual of the resources, history, institutions, and social and economic conditions of the Dominion". The 1948-49 edition of The Canada Year Book covers a period of approximately 16 to 17 months. Special articles dealing with normal, scientific and other civilian services, Physical Geography of the Canadian Western Arctic, Climate of Canada, Contribution to Science made by the Dominion Astrophysical Observatory, Chemical Industry in Canada, and others, are included along with current statistical information. Maps, both coloured and black and white, and many diagrams serve to illustrate the text.

CANADIAN TRADE INDEX, 1949.

Canadian Manufacturers' Association, Toronto, 1949. 1106 pp., illus., 10¼ x 6½ in., cloth, $6.00.

Included in the Canadian Trade Index 1949, is an alphabetical list of approximately 10,000 manufacturing firms with addresses, branches, brands and trade names, cable addresses and foreign representatives, and a classified list of thousands of industrial products with the names of firms manufacturing them. Newfoundland manufacturers are now listed.

Also included is a Special Export Section giving basic information in regard to government services, foreign trade controls, methods, financing, and price quotations.

All copies include a French Index of Products, and there are limited editions which include a French and Spanish Index of Products, and a French and Portuguese Index of Products.

NEW CANADIAN STANDARDS

CSA—B35-1949—Established List of Binding Head Machine Screws; 2d ed.:

This standard is intended to show the series of sizes and pitches, with head dimensions, body diameters, and screw and thread lengths, for machine screws used in the electrical trade for the purpose of securely holding wires or clips. The range of sizes given should be sufficient for all practical purposes.

CSA—E13-1949—Specification for Railway Wire Fencing and Gates; 2d ed.:

Section A—Railway Woven Wire-Fencing and Wire Fence Material, 50c.

This specification covers three standard classes of woven wire-fencing (9, 7 and 5 wires high), fence-wire (plain and barbed), locks for woven wire-fencing, and staples.

Section B—Railway Wire Fencing and Gates:

Covers four standard sizes of steel gates for railway wire-fences, including accessories, viz., hinges, bolts, hooks, staples, etc., and chain for fastening.

CSA—G28-1949—Specification for Carbon Steel Castings; 2d ed., 50c.

This specification covers mild-strength to medium-strength carbon steel castings for general application as dsitinguished from carbon-steel and alloy-steel castings requiring a tensile strength in excess of 70,000 psi. The specification is in substantial agreement with Specification A27-46T of the American Society for Testing Materials.

TRADE-MARKS:

H. Bennet. Brooklyn, Chemical Publishing Co., 1949. 479 pp., illus., cloth, $10.00.

This book gives a comprehensive list of trade-mark products, and supplies necessary information for the registration of trade-marks in the United States Patent Office. Four different ways of finding or coining original names are given in the text. Different types of available names are discussed in detail so that a provisional decision can be made in selecting the type of name particularly suited to a definite product.

U.S. HIGHWAY RESEARCH BOARD:

Bibliography No. 5—Classified Subject and Author Index of the Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering:

Intended to acquaint highway engineers with the papers presented at the Soil Mechanics and Foundation Engineering Conference held at The Hague in June 1948. Includes also a list of titles of papers contained in a volume on German developments in this branch of engineering.

Bulletin No. 16—Expressways:

Contains a report of the Committee on Effect of Controlled Access Expressways on Urban Areas, and three technical papers: Parking and Terminal Facilities: Effect on City Streets of Stage Construction of Limited Access Expressways; and Expressway Route Selection and Vehicular Usage.

...No. 17—Highway Planning:

Contains papers on the uses of highway planning survey data; the advantages of standardized road section designations: the uses of survey data in connection with highway safety; reporting highway traffic data; numerical ratings for highway sections as a basis for construction programmes; and highway planning in a rural state.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

A.S.T.M. SPECIFICATIONS FOR ROLLED STRUCTURAL STEEL.

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., May 1949. 34 pp., diagrs., tables, 9 x 6 in., paper, $1.00.

This pamphlet contains new and revised structural steel specifications together with the general requirements for delivery of rolled steel plates, shapes and bars for structural use.

COMMUNICATION CIRCUITS.

L. A. Ware and H. R. Reed. 3 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 403 pp., charts, diagrs., tables, 9¼ x 6 in., cloth, $5.00.

Intended as a text for students of communication engineering, this book presents the basic principles of communication transmission lines and their associated networks. The frequency range covered includes voice frequencies through the ultra-high frequencies. In this third edition, the rational MKS system of units is used, the chapter on transmission-line parameters is revised, and new problems and additional discussion added.

ELECTRIC CIRCUITS AND MACHINES:

B. L. Robertson and L. J. Black. D. Van Nostrand Co., Toronto, New York, London, 1949. 434 pp., diagrs., charts, tables, 9¼ x 6 in., leather $5.75 (in Canada).

This book presents the basic concepts that underlie electrical circuits, machines and electronics, and points the way to use of these principles in practical problems. Emphasis is on the alternating current circuit, particularly single phase. Problems are included at the end of each chapter and form an integral part of the text.

ELEMENTS OF SOUND RECORDING.

J. G. Frayne and H. Wolfe. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 686 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.50.

Providing useful information on basic sound problems, this book is of interest to the practical designer, operating engineer, and technician. It covers topics from the nature of sound to stereophonic recording. Subjects which belong exclusively to the restricted field of sound recording and reproducing are treated in detail. Closely related subjects are discussed briefly. For added clarity, numerical examples are used in a number of instances to illustrate the use of design formulas, and there is a limited use of complex mathematics.

FRANK AND LILLIAN GILBRETH, PARTNERS FOR LIFE.

E. Yost, published by Rutgers University Press, New Brunswick, N.J., and American Society of Mechanical Engineers, New York, 1949. 372 pp., illus., 8¼ x 5½ in., cloth, $5.00. A.S.M.E. copy, $5.50 with 20% discount to A.S.M.E. members.

In this combined biography, the early years of the two biographees are covered concurrently up to the time of their marriage. From that time on, the emphasis is on the partnership, both professional and domestic, which existed until the death of Frank Gilbreth. The methods of work and achievements of both are described during the period when they worked together, and the subsequent career of Lillian Gilbreth is carried on through the last three chapters.

HYDROLOGY. (PHYSICS OF THE EARTH—IX).

Edited by O. E. Meinzer and others. Dover Publications, New York, 1949. 712 pp., illus., diagrs., charts, maps, tables, 9½ x 6 in., cloth, $4.95.

This reprint of Volume IX of the "Physics of the Earth" series is of practical value to agronomists, engineers, physicists and geologists as it covers the whole hydrologic cycle in considerable detail. The several chapters and sections were contributed by authorities on the specific topics.

JET PROPULSION, TURBOJETS:

V. C. Finch. National Press, Millbrae, California, 1948. 328 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $5.50 prepaid.

Based on recently released technical information on the world's aircraft gas turbine power plants, this book presents a picture of jet propulsion for any one interested in aviation. It offers a technical treatment of the history of the gas turbine and the practical application of aero-thermodynamics to analysis, design and operation of turbojets. References are given at the end of each chapter, and many illustrations are included.

INVENTION AND INNOVATION IN THE RADIO INDUSTRY.

W. R. Maclaurin, with technical assistance of R. J. Harman, and foreword by K. T. Compton. The Macmillan Company, New York, Toronto, 1949. 304 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $6.00.

Written almost entirely in non-technical terms, this book traces the technical and economic development of radio from its scientific origins to the present, including FM and television. It describes technological advances which have shaped the industry, discusses key inventors and the role of companies in introducing improvements. The question of the patent system is dealt with in detail.

MODERN RAILROAD STRUCTURES.

C. P. Disney and R. F. Legget. McGraw-Hill Book Co., New York, Toronto, London, 1949. 213 pp., illus., diagrs., charts, tables, 10¼ x 7¼ in., cloth, $6.25 (in Canada).

This book is an illustrated record of some of the recent advances in the design and construction of the more important structures required for railroads. The importance of soil mechanics in railroad engineering is stressed, modern methods of treating railroad track are described, and recent improvements in the art of grouting and repairing concrete and masonry work are fully covered. The most extensive treatment is given to bridge types.

PRINCIPLES AND PRACTICE OF PRESTRESSED CONCRETE.

P. W. Abeles. Crosby Lockwood & Son, Ltd., London, England, 1949. 109 pp., illus., diagrs., charts, tables, 10 x 7¼ in., cloth, 15s.

This book, based on a series of articles in the British magazine, "Civil Engineering and Public Works Review", gives a full account of the history of prestressed concrete, the various systems of prestressing and methods of tensioning. The author reports on several groups of tests, compares "full" and "partial" prestressing, and describes in detail various practical applications of "pre-tensioning" and "post-tensioning".

SCAVENGING OF TWO-STROKE CYCLE DIESEL ENGINES

P. H. Schweitzer. Macmillan Company, New York, Toronto, 1949. 268 pp., illus., diagrs., charts, tables, 10¼ x 7½ in., cloth, $7.25.

The purpose of this book is to make it easier to design better two-stroke cycle diesel engines. It gives a full treatment of the scavenging operation and of port design. Avoiding complex mathematics and complicated formulas, the author uses charts readily applicable to design problems. A considerable bibliography and a discussion of scavenging terminology are included.

SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS, PROCEEDINGS, VOL. 6, No. 1.

Addison-Wesley Press, Kendall Square, Cambridge, Mass., 1948. 137 pp., illus., diagrs., charts, tables, 11 x 8½ in., cloth, $6.00.

Presenting 15 papers on various phases of stress analysis, this volume also contains the membership list of the Society and a cumulative index of the first five volumes of its proceedings. The papers are on such subjects as stress and strain states occurring in bending rectangular bars, direct coupled amplifier for recording, dynamic strain, and photoelastic laboratory equipment and methods.

TERRESTRIAL MAGNETISM AND ELECTRICITY. (PHYSICS OF THE EARTH—VIII).

Edited by J. A. Fleming and others. Dover Publications, New York, 1939 ed. reprinted with corrections in 1949. 794 pp., illus., diagrs., charts, maps, tables, 9½ x 6 in., cloth, $4.95.

Written by outstanding scientists in the field, this reprint of Volume VIII of the "Physics of the Earth" series surveys the findings of modern geophysicists in the field of terrestrial magnetism.

TIN, ITS MINING, PRODUCTION, TECHNOLOGY AND APPLICATIONS. (ACS MONOGRAPH 51).

C. L. Mantell. 2 ed. Reinhold Publishing Corporation, New York, 1949. 573 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $10.00.

This comprehensive and thoroughly critical monograph assembles all the authoritative available information for the use of those in the various fields in which tin is used. This second edition discusses new practices and procedures developed in ores and ore deposits, mining and ore dressing, smelting and metallurgy, tin conservation, tin uses, corrosion and analytical methods. Of special interest is the use of secondary tin including German, Continental and American practices.

TWO LECTURES:

1. Present Situation in the Theory of Elementary Particles.

2. Electron Theory of Superconductivity.

W. Heisenberg. University Press, Cambridge, England; American Branch, 51 Madison Ave., New York; Macmillan, Toronto, 1949. 52 pp., diagrs., 7½ x 4¾ in., cloth, $1.00.

The two lectures presented in this volume were delivered at the Cavendish Laboratory. In the first lecture the author tries to explain why the well-known divergencies in meson theory and nuclear physics may be considered as a natural feature of the present "correspondence" theory. The second lecture deals with an application of quantum mechanics, the theory of superconductivity.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

ELECTRON AND NUCLEAR PHYSICS.

J. B. Hoag. 3rd ed. revised by S. A. Korff. D. Van Nostrand Co., New York, 1948. 522 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $5.00.

Aims to present modern physics at the college level. The major changes and differences in this edition are the inclusion of the new material developed in the past few years. This includes the newer accelerating devices, the new experimental techniques, modern vacuum tubes, and a discussion of the neutron experiments and their bearing on the structure of the nucleus. No attempt has been made to use the methods of quantum mechanics.

ESSENTIAL METALLURGY FOR ENGINEERS.

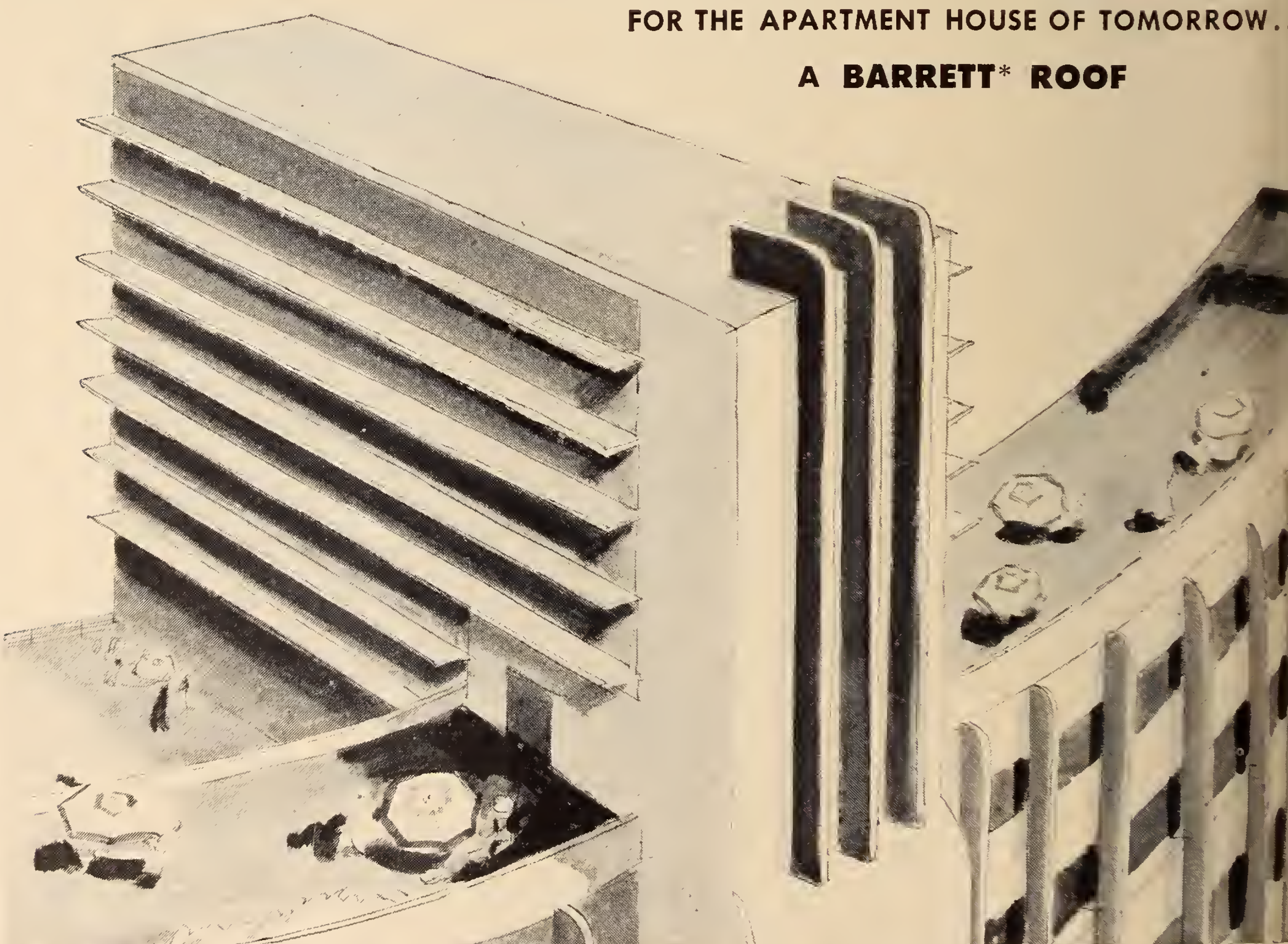
A. C. Vivian. 3rd ed. Sir Isaac Pitman & Sons, Ltd., London, 1948. 180 pp., illus., diagrs., charts, tables, 8 x 5½ in., cloth, 12s. 6d.

Written for engineering students, this book is devoted to the causes and control of the properties of metals and alloys. Amorphous and crystalline structure, solid solutions, and eutectics are considered prior to mechanical properties and metallurgical techniques. Various alloys are dealt with in detail. A glossary of terms is included.

WATER SUPPLY ENGINEERING.

N. E. Babbitt and J. J. Doland. 4th ed. McGraw-Hill Book Co., New York, Toronto, London, 1949. 637 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth. $6.50.

In this new edition, the authors have extended their policy of emphasizing practical applications. A discussion of theories such as is available in other textbooks has, in general, been omitted. Applications of theories to practice are given in the cases of finances, hydraulics, pumping machinery, electrical equipment, and water purification. New chapters have been included on intakes, aqueducts, and pipe lines. Revisions and additions are made to emphasize the timeliness and utility of the information presented.

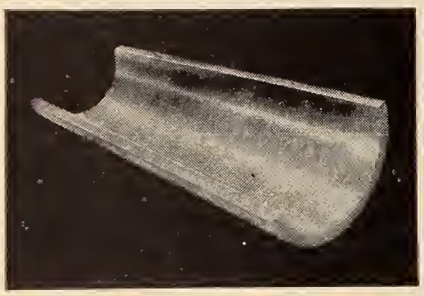


Engineering Facts about

Johns-Manville TRANSITE PRESSURE PIPE

Carrying Capacity

Examination of the interior wall of Transite* Pressure Pipe will quickly disclose its uniformly smooth surface. This smoothness, imparted during manufacture by forming each length under pressure on a highly polished steel mandrel, accounts for the high flow coefficient of Transite Pressure Pipe—C=140, based on the Williams and Hazen formula.



The unretouched photograph above shows Transite's exceptionally smooth interior surface —imparted by the polished steel mandrel on which the pipe is made.

Moreover, because Transite is made of asbestos and cement, it is inherently and completely immune to tuberculation. This means that the initial high carrying capacity of this pipe remains high in service—a fact which has been confirmed by accurate Pitometer tests.

One important advantage of Transite's maintained high carrying capacity is the assurance of an ample flow of water for both normal and fire-fighting needs in the years to come. Pumping equipment can be operated closer to peak efficiency; pumping costs can be held to a minimum. Taxpayers can receive the benefits of the favorable fire insurance rates which result from a modern, efficient water distribution system of ample capacity.

As indicated by tests, Transite's *maintained* carrying capacity helps provide the abundant fire-flow essential to adequate protection and to favorable fire insurance rates.

Accurate Pitameter tests conducted in the field verify Transite's maintained carrying capacity of C=140.

Another advantage—the engineer may design his water system with pipe of minimum diameter, rather than resort to larger pipe than would otherwise be necessary in order to offset the progressive reduction in flow caused by tuberculation. This practice is not necessary when Transite Pressure Pipe is specified.

And, of course, since tuberculation is not a problem, the costly expense otherwise involved in cleaning and lining of water mains can be eliminated.

A maintained high-carrying capacity is one of many advantages of Transite—the modern asbestos-cement pipe that was engineered to carry water more efficiently and more economically. For further facts, write for Brochure TR-11A. Address Johns-Manville, Toronto, Montreal, Winnipeg, Vancouver.

*Transite is a registered Johns-Manville Trade Mark

1-704

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Work has started in Britain on a large new research station devoted entirely to the development of mechanical engineering. It is situated at East Kilbride, Scotland, and is the only research centre in Britain dealing exclusively with this subject. The new station will cover some 70 acres and is being designed to employ about 700 research workers. The first stage of construction will cost about £500,000.

•

A series of Geiger counters have been developed by the National Research Council, Ottawa, since 1943 for use in the locating of uranium ore. In all, some twenty different models were made of which about six have been built in quantity. Designs for these have been released for commercial development and counters patterned on three of the models have been sold in quantity by Electronics Associates, Toronto. The National Research Council has no patent on the various designs and the Division of Physics, in which the development of the counters took place, will be glad to place its experience in this field of work at the disposal of Canadian manufacturers.

•

To meet the needs of contractors requiring a heavy-duty crane-excavator mounted on rubber, Bucyrus-Erie Co., South Milwaukee, Wis., have produced a new transit crane. It is known as the 22-B. The new wheel-mounted excavator has been engineered to deliver performance familiar to those who own its counterpart, the crawler-mounted 22-B. Wheelbase of the new mounting is 181 inches with an overall width of 8 feet. For complete specifications, communicate with the manufacturer.

•

What is believed to be the world's largest chemical plant was opened recently, by Lord McGowan, chairman of Imperial Chemical Industries, at Wilton, North England. When completed, the works will cover an area of over three square miles.

•

Construction of hydro-electric developments throughout Canada went forward vigorously during 1948, according to the Dominion Water & Power Bureau. Installed capacity was increased by 440,095 hp. The average pre-war annual increase was about 300,000 hp.

•

According to information received from the Department of Trade & Commerce, permits are now required for the import of certain iron and steel products, including pig iron, ingots, blooms, billets, bars, rods, plates, sheets and forgings. This measure has been taken in the interest of conserving foreign exchange. The tariff items for which import permits are now required are 374, 377, 377a, 377b, 377c, 377d. 377e, 377f, 377g, 378, 379, 380, 385, 385a, 386, 392, 392a, 392b, 440f.

Information regarding import procedure is available from all customs officers or from the Import Control Division, Department of Trade & Commerce, Ottawa.

•

Variations in building regulations in the different provinces in Canada were discussed at a conference at Ottawa on September 19th. At the conference were representatives of provincial governments and the associate committee on the National Building Code. The associate committee was formed by the National Research Council.

Provincial legislation related to building construction was reviewed. Discussion revealed a marked similarity in problems of the various provinces and put emphasis on a few important questions which must receive considerable attention if the goal of uniform and adequate building codes is to be attained.

•

The new plant of The Patterson Foundry & Machine Co. (Canada) Ltd. is now in full operation. It is located at 250 Danforth Road, Scarborough, Ont.

The new plant has a floor area of 25,000 square feet and is fully equipped to manufacture the Company's complete line of industrial processing machinery and equipment.

•

Polythene sheeting and "lay-flat" tubing will be made at the Shawinigan Falls Consolidated Works of Canadian Industries Ltd.

Machinery for extrusion of the film is being installed and production will begin about mid-winter. To date all polythene film used in Canada has been imported from the United States.

•

Designed to be easily carried in pocket or tool kit, a new thread sealing compound called "Thread-Tite", is being manufactured and marketed by Armite Laboratories, 6609 Broad St., Los Angeles 1, Cal. The manufacturer claims that the application of this stick to pipe threads before joints are made up will provide a positive seal against gases, brine, acids, water, steam and ammonia at high and low pressures and temperatures. It may be applied to steel, aluminum, iron, brass, plastic, copper and threads in any other type of material.

•

British steel manufacture in 1949 is higher than in 1948. The first nine months of this year show a 5% increase above the same period last year. More than a quarter of a million passenger cars were produced in the first 34 weeks of this year—17 per cent above the same weeks of 1948—26 per cent more commercial vehicles and 20 per cent more motor and pedal cycles were manufactured. Deliveries of new aircraft were nearly one-third above the 1948 average.

•

Construction of the largest oil tanker ever to be built in a Canadian shipyard is part of the programme for bringing western crude oil to eastern Canadian markets. This information was given by John R. White, vice-president of the Imperial Oil Ltd. Mr. White was speaking before a joint meeting of this Institute and the Institute of Mining & Metallurgy. Mr. White said that the tanker will be 620 ft. in length, will have a speed of 13 knots and a carrying capacity of 115,000 barrels. A ship of this class could move more than five million barrels of oil from the projected pipe line terminal at Lake Superior to the refinery at Sarnia.

Mr. White released the above information on October 14th. At that time award of the building contract had not been made.

•

An electronic air cleaner is being installed in the Parliament wing at the British House of Commons. It is claimed that the equipment will remove 85 to 90 per cent of the airborne dust and dirt entering the chamber.

This electronic air cleaner is being built in England under a Westinghouse license.

Dr. George S. Hume, Federal Government mines official, said recently that natural gas reserves in Alberta are now large enough to permit the construction of a pipe-line to the Pacific Coast.

"I am convinced," said Dr. Hume, "that after reserving sufficient gas for Alberta for the next century, there is plenty of scope for pipe-line construction both to the Pacific coast and perhaps even to Ontario, supplying cities and towns en route."

•

The Otis-Fensom Elevator Co. Ltd., largest Canadian manufacturer of elevators and other vertical transportation equipment, has changed its name to Otis Elevator Co. Ltd. Announcement of the change was made by W. J. W. Reid, M.E.I.C., Company president.

This change in name is in line with a policy of simplifying and unifying the names of the many international affiliates and subsidiaries throughout the world of the Otis Elevator Co. in the United States. The Otis organization consists of companies, branches, agencies, and plants with 457 offices in 53 countries.

Head office and works of the former Otis-Fensom Co. will remain at Hamilton, Ont., and there will be no change in autonomous operation and full-scale manufacturing activities in Canada. The change does mark, however, the end of the firm's active association with the Fensom family which for over 75 years has been prominent in Canadian construction and financial affairs.

The relationship between Otis in Canada and its parent associate in the United States has resulted in a close interchange of knowledge and experience. Canada has benefited from American progress in the vertical transportation field through Otis-Fensom. On the other hand, the American company now is rounding out the scope of its manufacturing operations by developing a \$5,000,000 architectural products plant. This project is based largely on 20 years experience of Otis-Fensom which entered this field in 1928. Independent full-scale Canadian operation with access to the benefits of American and international progress will continue unaffected by the change of title to Otis Elevator Co. Ltd.

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Preparations are now under way for the third Canadian International Trade Fair to be held in Toronto, May 29th to June 9th, 1950.

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Lathe centres with 60 degree tungsten carbide tips are now being manufactured by South Bend Lathe Works, South Bend, Ind. These tips are being made for use on lathes, grinders, and other machine tools. They are recommended for production jobs requiring high spindle speed, long continuous cuts, heavy roughing operations, etc. They are available with standard No. 2 and No. 3 Morse taper shanks.

Additional information may be obtained from the Company. The street address is 359 East Madison St., South Bend 22, Ind.

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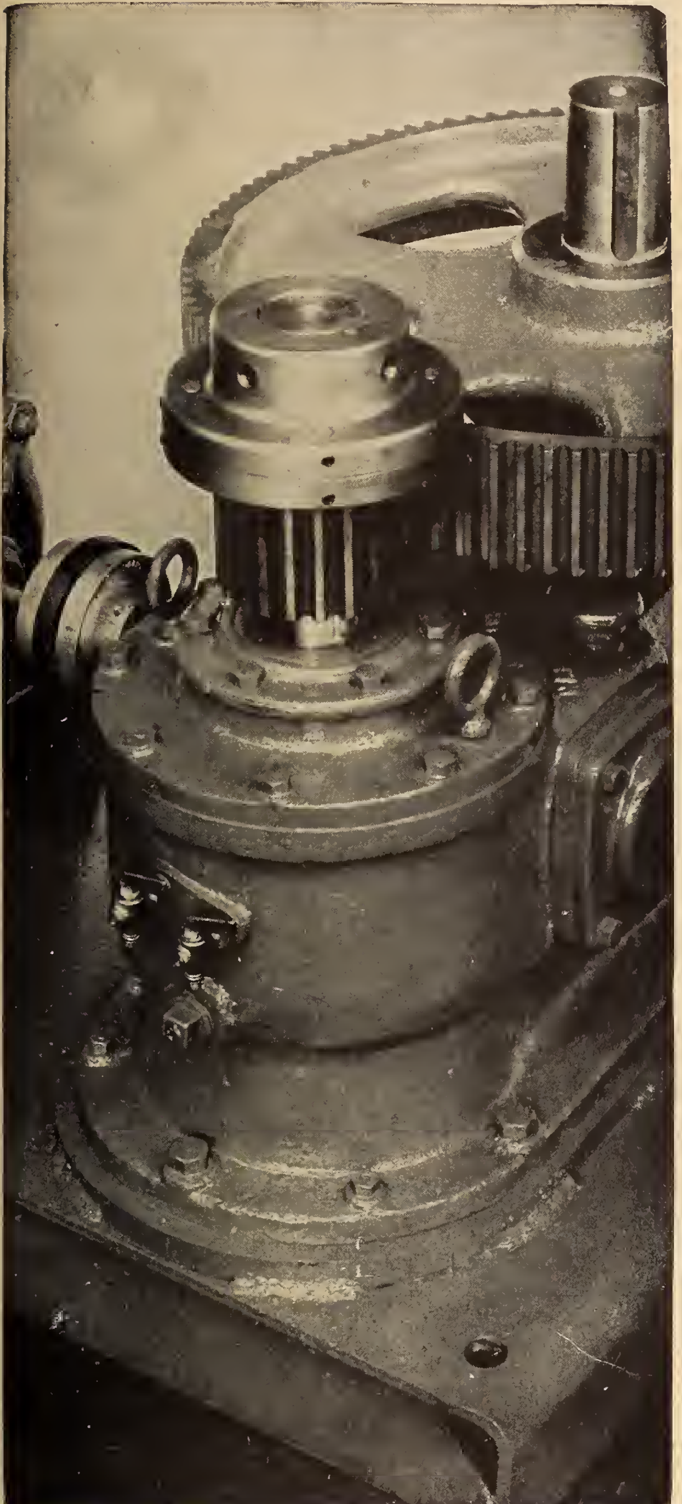
In Britain, tests have been completed on a portable atomic plant. The plant was developed by British scientists during three years of experimental work. It is designed for use in hospitals, medical centres, and health research units. The equipment tested is easily trans-

Gear Drive Units of Every Type

CUT GEARS

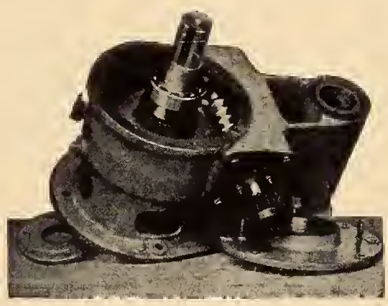


Wherever high speed power is applied to low speed use, our worm gear units give efficient service. Any type of drive can be supplied from our sixty standard patterns, most of the smaller series being carried in stock.

This is a type VO vertical worm unit and motor on a welded steel bedplate, with a shear-pin coupling half integral with the second-reduction spur pinion.

Chester B. Hamilton Jr.
President

Industrial Gear Drives
Made in Canada
for 38 years



Hamilton Gear and Machine Co.
Limited

The Industrial Cut Gear Specialists

950-990 Dupont St. TORONTO-4

Montreal Branch office
Edw. P. Corner, Mgr.
1838 Dorchester St. West
Montreal, P.Q.

Manitoba
T. S. Taylor Machinery Co.
197 Bannatyne Ave. E.
Winnipeg, Man.

Alberta
Waterous Ltd.
Edmonton, Alta.

British Columbia
B. C. Conveying Machinery Co
Geo. B. Simpson, Manager
3300 Fraser St., Vancouver, B.C.

ported. It produces isotopes by using uranium in the form of pure oxide. There is no danger from radiation since its range is limited and nullified by adequate safeguards.

•

According to information released by the International Nickel Co. of Canada Ltd., a new cast iron, which is not brittle and can be bent or twisted, has been developed.

The Company claims that this new material can be made readily and economically, and it is believed to be the most outstanding metallurgical development in the foundry industry since malleable iron was made from cast iron over a hundred years ago. Complete information may be obtained from Nickel Information Service, International Nickel Company of Canada Ltd., 25 King St. W., Toronto 1, Ont.

•

Cornell University's nuclear science research centre is now in the Floyd Newman Laboratory of Nuclear Studies.

The Laboratory was formally named for Mr. Newman, a Cornell graduate of the class of 1912, at a ceremony held at the University on October 21st. Mr. Newman gave approximately $1,000,000 to the project. The laboratory consists of two units—a five-storey laboratory and office building and an adjoining structure housing a 300,000,000 electron-volt synchrotron which was constructed with the support of the Office of Naval Research.

•

A power cable closer, constructed in Canada and described as being one of the largest machines of its type in the world, was recently put into operation at the Lachine plant of Northern Electric Wire & Cable Division. Its installation was an important move resulting from the initial planning for the Company's post-war manufacturing facilities and, together with other equipment and development work, will materially help in prominently establishing the Company among manufacturers of high-power voltage cables.

•

On November 2nd the Interprovincial Pipe Line Co., Edmonton, Alta., announced that contracts for supplies and construction totalling more than $41,000,000 have been let for the 1,150 mile pipe line from Edmonton to Superior.

Loren F. Kahle, executive vice-president of the Company, said "The problem of moving Alberta oil to new markets at low cost is so urgent that it is essential the pipe be in the ground by next fall. We are getting on with the job as quickly as possible. Pipe line construction of this magnitude demands highly-trained, experienced supervisory staff and special equipment of a type not previously used on a large scale in Canada. We expect that 10 spreads of equipment will be in use at one time along the route, and the equipment in each spread will represent an investment by the contractor of about three-quarters of a million dollars. Large numbers of men will be needed for the project and we have stipulated that wherever possible they be hired locally. While the prime contractors number only three, a number of sub-contractors will be required to complete the job on time. We have stipulated that sub-contracts be let locally wherever possible."

Prime contract for the construction of the 450 mile Edmonton-Regina section of the line, where 20-inch pipe will be laid, will be held by the Canadian Bechtel Co. associated with Fred Mannix of Calgary. The 340-mile Regina-Gretna section of 16-inch pipe will be laid by Williams Bros., and the 360-mile U.S. section of 18-inch pipe from Gretna to Superior will be constructed by Anderson Bros.

Surveying and staking of the proposed route is being done by Underwood and McLellan of Saskatoon, and aerial photographs are being taken by Photographic Survey Co. Ltd. of Toronto. Excavating and grading at Edmonton will be done by the Doncaster Construction Co. and grading, surfacing, and other preparatory work for the pump station at Ermine will be handled by the Bird Construction Co. Ltd. of Winnipeg.

Total cost of laying the line, excluding materials, is roughly $14.7 million. Several contracts for construction and supplies are still to be let. Steel plate for the line is being rolled by The Steel Co. of Canada Ltd., and it is being made into pipe by Page-Hersey Tubes Ltd. Pipe of 18-inch and 20-inch size is not made in Canada and this order has been placed with A. O. Smith Corpn. of Milwaukee. The value of work now in hand is in excess of $11,000,000. The following is a summary of the value of orders placed: steel plate and pipe $8,000,000. Diesel engines, Dominion Engineering Co. Ltd., $850,000; pumps, Canada Iron Foundries Ltd. $100,000; speed increasers, Dominion Engineering Co. Ltd., $105,000; waste heat boilers and heat exchangers, Foster Wheeler Ltd. $107,000; tankage at Edmonton, Horton Steel Works Ltd. $550,000; enamel and priming solution for coating pipe, By-Product Coke Co. of Canada Ltd., $650,000; glass pipe wrap, Fiberglass Canada Ltd., $280,000; asbestos felt wrapping, Canadian Johns Manville Ltd. and The Philip Carey Co. Ltd., $350,000.

•

A new model Thermobloc self-contained direct-fired industrial heating unit has been announced by Prat-Daniel Corporation, East Port Chester, Conn. This equipment has been designed for the tempering of make-up air in buildings where a ventilating system imposes heavy loads on the heating plant in cold weather. The new units are designed to be positioned along the walls, with air intake duct running through the wall This feeds outside air to the units where its temperature is raised the desired number of degrees before it is discharged into the working area. Complete information may be obtained from the manufacturer.

Appointments and Transfers

John McPherson Paterson is the senior Canadian representative of Aveling-Barford Ltd. of Grantham, England. Aveling - Barford are internationally known as manufacturers of road rollers, dumpers, and calfdozers.

Mr. Paterson has established Company headquarters in Canada at 9 Brule Gardens, Toronto 3 — telephone Murray 2454.

Born in Glasgow, Scotland, and a graduate of the Glasgow Technical College, Mr. Paterson has had long experience in connection with the products of

J. McP. Paterson

his Company. He joined Barford & Perkins Ltd. in 1927 as technical sales representative for Scotland, and subsequently transferred to an associate company, Aveling & Porter Ltd., for work on the development of specialized construction plants. In 1939 he was appointed regional sales manager for Ireland for the joint company Aveling-Barford Ltd., but he returned to England early in 1940 for special war duties. In 1945 he was appointed sales administrator for the west of England and Wales, and in 1948 was transferred to Canada to establish sales and service connections throughout this country.

The following companies are sales and service representatives in Canada for Aveling-Barford products:

Fredericton, N.B., J. Clark & Son Ltd., 123 York St.; Quebec City, F. H. Hopkins & Co. Ltd. (see Montreal address); Montreal, F. H. Hopkins & Co. Ltd., 8500 Decarie Blvd.; Toronto, M. L. Baxter Ltd., 1900 St. Clair Ave. W.; Winnipeg, Vulcan Iron & Engineering Ltd., Sutherland St. at Maple; Calgary, Industrial & Road Equipment Ltd., 8th St. and 10th Ave. W.; Edmonton, Industrial & Road Equipment Ltd., 10626 101st St.; Vancouver, Vancouver Engineering Works Ltd., 519 West 6th Ave.

These representatives maintain a complete stock of parts and they have available, for immediate delivery, the products of this well-known British manufacturer.

•

E. J. Jones has been appointed deputy minister of the British Columbia Provincial Works Department. He succeeds the late Norman W. Macpherson.

Mr. Jones has been with the Department since 1921 and has held the following positions: district engineer at Kamloops, special engineering appointments in North Okanagan, Cariboo, Cranbrook and New Westminster.

The Holden Co. Ltd., Montreal, have been appointed exclusive Canadian sales agents for Eclipse Seamless Flexible Metal Hose.

•

The Holden Co. have been engaged in the railway, shipbuilding and industrial supply business for more than half a century. A national sales organization is maintained with offices in Moncton, Toronto, Winnipeg and Vancouver.

•

Ralph G. Walsh is now general manager of the Deloro Smelting & Refining Co. Ltd., Deloro, Ont. He succeeds the late Arthur V. Yates.

•

George H. Harlow has been appointed manager of the Ontario Division of Dominion Engineering Co. Ltd.

Mr. Harlow graduated in mechanical engineering from the University of Toronto in 1922. He has served in the technical departments of two rubber companies and joined Dominion Engineering Co. Ltd. in 1932 as a sales engineer. He will make his headquarters in the Toronto office of the Company.

Publications

For copies of the publications mentioned above please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Spielman Agencies Ltd., 420 Lagauchetiere St. West, Montreal, offer specification No. 11 in which is described the application of permanently waterproof stucco, pebble-dash and roughcast.

•

The Bristol Company of Canada Limited, 71-79 Duchess Street, Toronto, have available copies of an 8-page 2-colour bulletin describing the Series 500 Bristol Recording Absolute Pressure Gauge. Ask for bulletin G620. The bulletin measures 8½ x 11 in. It is well produced and contains all essential information on the gauge it describes.

•

Charles Bruning Company Inc., 4754 Montrose Avenue, Chicago 41, Illinois, has released Bulletin A-1062. In this bulletin is described the "Bruning Standard Drafter" which introduced a new "Equipoise" mechanism. These drafters combine the functions of T-Square, straight-edge, triangles, protractors and scales into a single precision machine. For further details consult the bulletin.

•

The publication of CSA Standard B1.-1949, "Unified and American Screw Threads", the details of which may greatly affect the future operations and production of Canadian industry, was announced recently by the general manager of the Association.

Copies may be obtained from the Canadian Standards Association, National Research Building, Ottawa. The price is $3.00 per copy.

•

Curtis Lighting of Canada Limited, 195 Wicksteed Avenue, Leaside, Toronto 17, offers a publication "Curtis Fluorescent Troffers". In the bulletin are described matching incandescent recessed units designed for use with acoustical ceilings. They are so manufactured that when installed they give the illusion of continuous unbroken ceiling surfaces. Ask for the bulletin by name.

•

Proof against frost, easy operation, simplicity of construction, sturdiness and reliability — these are all claimed to be inherent features of the new Crane Sanitary Water Hydrant. The de-icing effect is obtained by means of an elastic tube pre-stretched during insertion in the spout. The stretching reduces the diameter of the tube against the spout at the end. Inside and outside pressures on the tube are equalized by holes in the spout. In freezing weather, water in the tube is expelled to the minimum diameter to which the tube is forced by the pre-stretching and it freezes in a thin pencil of ice. When the valve is again opened, water pressure expands the tube and the initial flow is around the ice which is broken and expelled. For complete information ask for circular AD1774 which may be obtained from any Crane branch or from the General Office, 1170 Beaver Hall Square, Montreal.

•

"Caterpillar" Diesel Motor Graders is the title of a 31-page booklet released by the Caterpillar Tractor Co., Peoria S. Illinois.

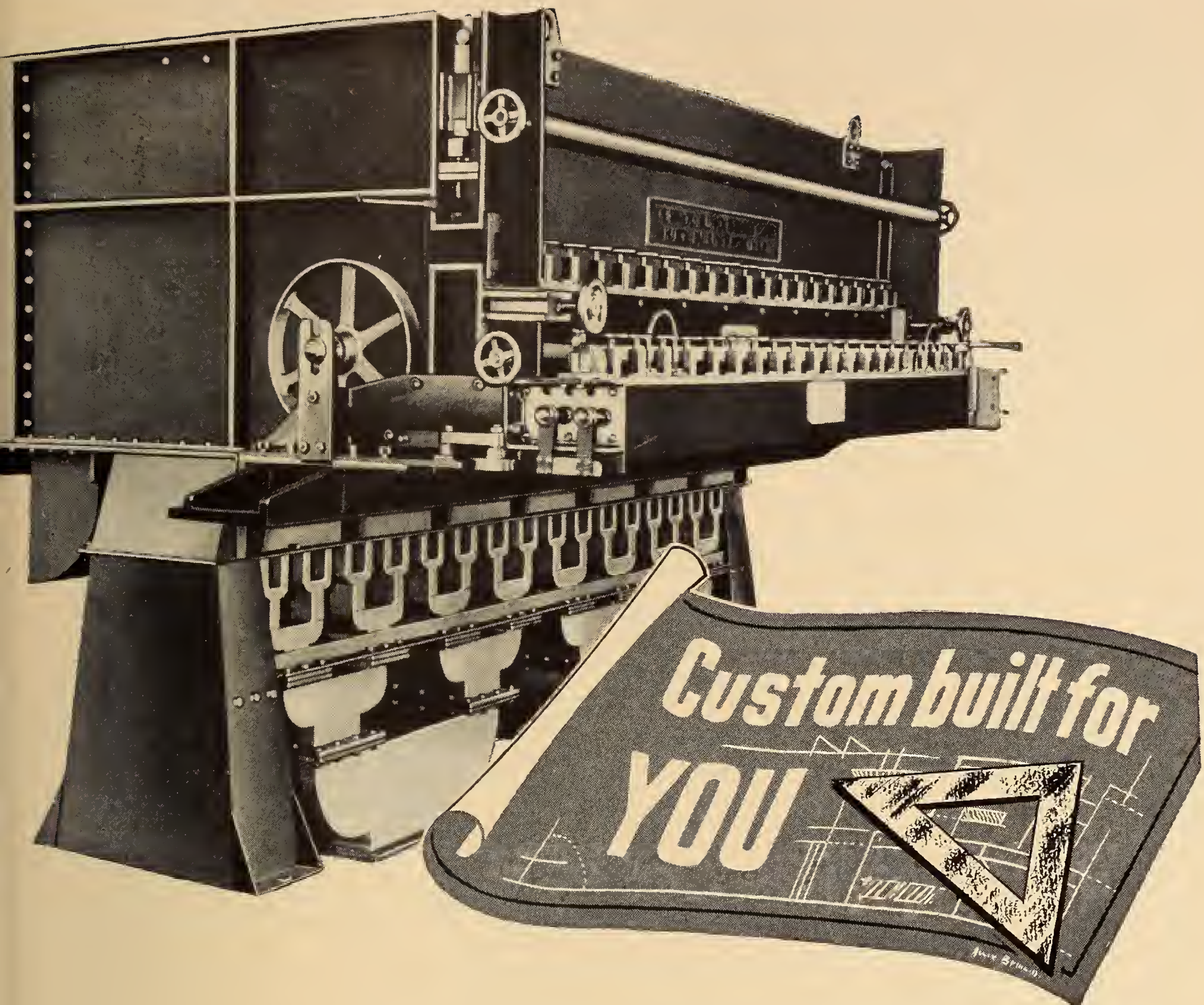
The booklet presents illustrations and data on various applications of the Company's three models, the 100 hp. No. 12, the 70 hp. No. 112, and the 50 hp. No. 212 Also included are engine cutaway pictures and close-up views of different parts and attachments of these units. Ask for form No. 11960.

•

Webster & Sons Limited, 724 Canada Cement Building, Montreal 2, P.Q., offer a 38-page booklet "Zonolite — How to Use It". The booklet contains general information on "Zonolite" Insulating products—38 pages, pocket-size.

•

The Bristol Company of Canada Ltd. has released a highly informative bulletin "The New Bristol Electronic Pyrotrol". This control apparatus is designed as a combustion safeguard for gas fired furnaces, ovens, kilns, boilers, dryers, air heaters, kettles and other similar heating equipment. Page size is 8½ by 11 inches and the bulletin is punched for inclusion in a three ring filing binder. Ask for bulletin No. W. 1816. The address of the Company is the Bristol Company of Canada Ltd., 71-79 Duchess street, Toronto 2, Ont.


Custom built for
YOU

The Patterson Foundry & Machine Co. of (Canada) Ltd., 250 Danforth Rd., Scarborough, Ont., offers a 36-page two colour, condensed catalogue of the machinery and equipment they manufacture. The products of the Company are designed primarily for use in chemical and processing industries. When ordering the catalogue, for which there is no charge, ask for CEC—49.

•

A critically evaluated compilation of all known data on the energy levels of elements of atomic number 1 through 23 has recently been published by the National Bureau of Standards. Copies are now available from the U.S. Government Printing Office, Washington 25, D.C. The charge for the publication is $2.75 (U.S. funds).

•

Taylor Forge & Pipe Works Inc., Chicago 90, Ill. (P.O. Box 485) have released Bulletin No. 485 "Corrosion Service Piping". The bulletin is a comprehensive treatment on stainless steel and nickel alloy anti-corrosion and anti-contamination piping. Economics, standards, advantages of welding, extensive technical data, design tips, and complete dimensional information on stainless fittings and flanges are included in the 32 page publication.

The information contained in the bulletin, the style of presentation and the quality of printing are of a very high quality.

•

The Rudel Machinery Co., 614 St. James Street West, Montreal, are Canadian agents of the Nelson Stud Welding Division of Morton Gregory Corporation. They now have available for immediate delivery the "Nelson Stud Welder".

This equipment will be of particular interest to general, roofing, sheet metal, lathing and plastering, electrical, plumbing and heating, contractors and machine manufacturers. The Canadian distributers have available a wide range of descriptive material and copies wil be sent to readers of the Journal, by return mail, on receipt of request.

•

The October issue of the "C.I.L. Oval" will be of particular interest to engineers. It contains articles on fire prevention and on split second blasting. Copies may be obtained by applying to: The Editor, C.I.L. Oval, Box 10, Montreal.

•

Mine Safety Appliances Co. of Canada Ltd., 500 MacPherson Avenue, Postal Station "E", Toronto, offers a single sheet bulletin describing new types of portable ventilators. Ask for bulletin CU—2.

•

Designed for drying lacquers, finishes, and other material requiring temperatures up to 500° Prat-Daniel Corporation, East Port Chester, Conn., has introduced a new model of Thermobloc self-contained direct fired industrial heating unit. The primary unit is a gas or oil fired heater of 300,000 or 550,000 Btu's per hour, employing forced air circulation. The new model is designed to re-circulate its air until the desired temperature is reached. The company will be pleased to supply complete descriptive material.

•

The Canadian Fairbanks-Morse Co. Ltd., 980 St. Antoine Street, Montreal 3, Que., are Canadian agents for the Cincinnati Gilbert Machine Tool Co. Complete descriptive literature on the products of this manufacturer may be obtained on application to the sales promotion department of the Canadian Fairbanks-Morse Co. Ltd.

•

The Caterpillar Tractor Co., Peoria 8, Illinois have produced three excellent bulletins, "Public Utilities", "Bucking Snow Costs", "Why 'Cat' Power is Best for the Pumping Job". Ask for these publications by name.

•

The Honourable C. D. French, minister of mines for the Province of Quebec, has announced the publication of a geological report describing a reconnaissance survey of a section of the upper part of Romaine River. The survey was made by Jacques Claveau for the geological surveys branch of the Department of Mines.

Romaine River has its source about one hundred and seventy-five miles due north of Havre St. Pierre, a village on the north shore of the Gulf of St. Lawrence. The section of the river examined extends between latitudes 51° 05' and 52° 05' North a distance of seventy miles. This report (G.R. 38) with an accompanying coloured geological map may be obtained from the deputy minister, Department of Mines, Parliament Buildings, Quebec.

Burndy Canada Ltd., 381 Greenwood Avenue, Toronto 8, Ont., have published a bulletin describing "Y9M Hytool for Connecting Small Wires". In a review accompanying the copy of the bulletin which was sent to the editor, it was stated " A new indenting tool is announced by Burndy Canada Ltd., which will cut wire, strip insulation and indent hydent connectors onto the wire, all in a matter of seconds. This tool, which covers wire sizes No. 22 to No. 10 will also close the insulation grip which is provided on many of Burndy's indent connectors. The tool has durable plastic handles for comfortable manipulation."

For copies ask for bulletin Y9M.

•

The International Nickel Company of Canada Ltd., 25 King Street West, Toronto 1, Ont., offer the following highly informative publications. "Keeping Operating Costs Down When Temperatures Go Up". A 20-page booklet discussing special problems of the heat treating industry. Ask for bulletin JT-1452. "Immunized Sterilizers" in which are given reasons for the current trend toward Monel and nickel-clad steel in sterilization equipment. Ask for JT-629.

A special bulletin is also offered — it deals with the forging of Monel "K" Monel, Nickel, Duranickel, Inconel and Inconel "X". Ask for technical bulletin T-11.

•

The August 1949 issue of "The Dominion Engineer," published by the Dominion Engineering Co., P.O. Box 220, Montreal, contains a description of the high speed paper machine recently installed at Bowater's Newfoundland Pulp and Paper Mill at Corner Brook. The publication will be pleased to place Journal readers on the mailing list for this company periodical.

•

Link-Belt Limited, Eastern Avenue at Leslie and Keating Street, Toronto 8, announce the completion of an entirely new 112-page detailed catalogue and engineering data book covering the Company's complete line of ball and roller bearings.

The new book emphasizes the important construction features and gives list prices, weights, load ratings and all necessary dimensions for the various standard models available. Information is also given to assist in the selection of the right bearing for the specific service and drawings of typical applications are shown. Other pages are devoted to welded steel base plates, lubrication fitting data, maintenance and lubrication, shafting, Company manufacturing facilities, etc. Ask for bulletin No. 2550.

•

Air Control Installations Ltd., Victoria Road, Ruislip, Middlesex, England, offer an eight page publication "What We Make".

This company specializes in the manufacture of centrifugal fans, axial flow fans and humidifying, heating, air filtration, dust collection, and drying apparatus. The bulletin is well illustrated and gives useful information in a condensed form.

(*Turn to page 806*)

STEELOX BUILDINGS

A PERMANENT, ATTRACTIVE BUILDING AT LOWEST COST!
AND IT CAN BE SUPPLIED TODAY

The Steelox Building can be erected by local labour in several days. They are all steel yet are so adaptable they can be supplied in sizes to meet any need. Windows, doors and partitions can go where you want them.

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FUNCTION OF BUILDING.............................

NAME..

ADDRESS.........................CITY...............

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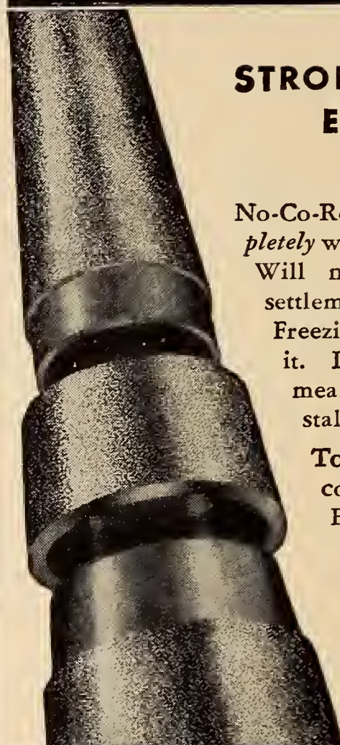

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Tough and durable—made of coal tar pitch and cellulose Fibre. Specify it for House-to-Sewer or House-to-Septic Tank Connections, Downspouts, Water Conductor Lines and other non-pressure uses.

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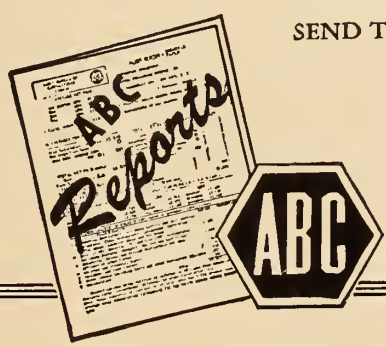
A.B.C. reports are primarily for the benefit of advertisers in making it possible for them to select media on the basis of facts and to buy space with the assurance of receiving full measure for their advertising dollars. The interests of advertisers are additionally served through the publisher's use of the reports as a perpetual survey of subscribers and as a guide in building and maintaining the reader interest that contributes to advertising value. Ask us for a copy of our A.B.C. report and then study it. It provides a continuing survey of our subscribers.



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BUSINESS AND INDUSTRIAL BRIEFS

(Continued from page 802)

Dravo Corporation, 1203 Dravo Building, Pittsburgh, Pa., have available for distribution a new folder in which is described "Beaver Hoisting Towers" which are manufactured by Beaver Art Metal Corporation, Ellwood City, Pa. The towers are built of tubular steel and are available in single and double shaft types up to 1200 ft. Ask for bulletin describing "Beaver Hoisting Towers".

•

A new 36-page illustrated Book No. 2065, on Link-Belt Silent Chain Drives for automotive and industrial engines, buses and trucks has been published by Link-Belt Company. Copies are available. Apply to Link-Belt Limited, 791 Eastern Ave., Toronto, Ontario.

•

A 12-page catalogue No. EL-49-312 issued by Russell & Stoll Company Inc., 125 Barclay Street, New York 7, N.Y., features automatic locking "Midget Ever-Lok" plugs, receptacles and cord connectors. The catalogue is well illustrated and contains dimensional drawings. Copies are available on request.

•

Mine Safety Appliances Company of Canada Limited, 500 MacPherson Avenue, Toronto, Ontario, offer copies of a single sheet pamphlet in which is described a Gas-Fume Respirator for protection against mists, dusts, fumes, organic vapors and acid gases which occur in burning, spraying, pouring, welding, cutting and other industrial operations.

•

International Diesel Electric Company, 13-02 Forty-Fourth Avenue, Long Island City 1, New York, offers Bulletin 112 in which is described the Company's diesel and gasoline engine-driven generator sets designed for emergency or continuous service. These sets range in capacity from 5 k.w. to 250 k.w.

•

"Agitated Gas Absorbers," a paper by Kenneth S. Valentine, has been published by The Patterson Foundry & Machine Company Ltd., Toronto.

Mr. Valentine's paper discusses the processes for which gas absorption apparatus of the mechanical agitator type is best suited. Drawings show gas absorption systems and there are detailed examples of the reactions for which they can successfully be used. The address of the supplier is 624 Mount Pleasant Road, Toronto.

•

The new Manco "Guillotine" with shear-type cutting blade is claimed to be the only portable hydraulic hand tool ever developed capable of cutting both wire rope up to 1¼ inches in diameter and mild steel rod up to ¾ inch. This same tool can also be obtained with special centre-cut blades for rod only, which will cut ¾ inch reinforcing and 1 inch mild steel. The Guillotine can also be adapted to perform crimping, swedging and bending operations.

Detailed information, in bulletin form, may be obtained from Manco Mfg. Co., Bradley, Illinois. Ask in particular for bulletin G-10.

•

The Sharples Corporation, 23rd and Westmoreland Streets, Philadelphia 40, Pa., has produced a very elaborate 24-page bulletin on "Super Centrifuges". The bulletin is printed in three colours and it describes the manufacture, operation, and use of the various pieces of centrifuge equipment manufactured by the Company. Ask for bulletin No. 1248.

•

Charles Bruning Company Inc. 4754 W. Montrose Avenue, Chicago 41, Illinois has announced the "Model 50" Bruning Whiteprinter. This printer is designed to fit the requirements of users who need a compact machine capable of producing up to 10,000 square feet of B & W prints during an ordinary working day. The Model operates at variable speeds up to 24 feet per minute. Prints are delivered flat and dry, ready for instant use, neatly stacked in a receiving tray on the front of the machine.

Operation is odorless, no plumbing or ventilating ducts are required and prints ranging from post card size to 42 inches in width and of any length may be made.

•

Complete data on liquid-in-glass industrial thermometers is presented in an easy-to-use tabular and sectionalized form in the new bulletin "E" published by the Precision Thermometer and Instrument Company, 1471 Brandywine St., Philadelphia 30, Pa.

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 32 | MONTREAL, DECEMBER 1949 | NUMBER 12

Indexed in The Engineering Index

Price $4.00 a year in Canada, British Possessions, United States and Mexico. $5.50 a year in Foreign Countries. Current issues, 50 cents a copy, back issues 75 cents a copy. To members and affiliates, 25 cents a copy, $2.00 a year.—Authorized as second class mail, Post Office Department, Ottawa.

"To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interests, to encourage original research, to develop and maintain high standards in the engineering profession and to enhance the usefulness of the profession to the public."

★ ★ ★

CONTENTS

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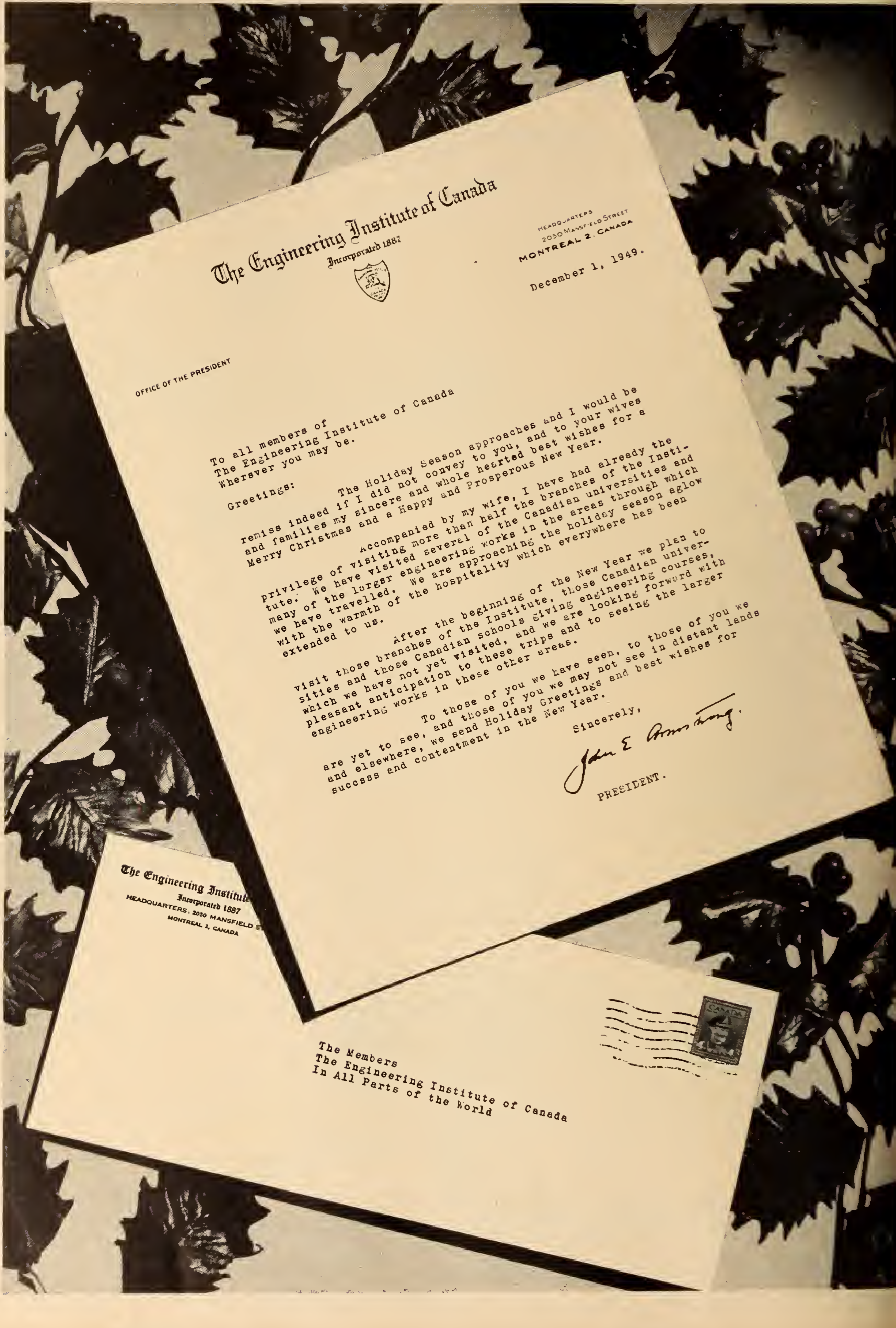

The Engineering Institute of Canada
Incorporated 1887

HEADQUARTERS
2050 MANSFIELD STREET
MONTREAL 2, CANADA

December 1, 1949.

OFFICE OF THE PRESIDENT

To all members of
The Engineering Institute of Canada
Wherever you may be.

Greetings:

The Holiday Season approaches and I would be remiss indeed if I did not convey to you, and to your wives and families my sincere and whole hearted best wishes for a Merry Christmas and a Happy and Prosperous New Year.

Accompanied by my wife, I have had already the privilege of visiting more than half the branches of the Institute. We have visited several of the Canadian universities and many of the larger engineering works in the areas through which we have travelled. We are approaching the holiday season aglow with the warmth of the hospitality which everywhere has been extended to us.

After the beginning of the New Year we plan to visit those branches of the Institute, those Canadian universities and those Canadian schools giving engineering courses, which we have not yet visited, and we are looking forward with pleasant anticipation to these trips and to seeing the larger engineering works in these other areas.

To those of you we have seen, to those of you we are yet to see, and those of you we may not see in distant lands and elsewhere, we send Holiday Greetings and best wishes for success and contentment in the New Year.

Sincerely,

John E. Armstrong.

PRESIDENT.

The Engineering Institute
Incorporated 1887
HEADQUARTERS: 2050 MANSFIELD ST.
MONTREAL 2, CANADA

CANADA

The Members
The Engineering Institute of Canada
In All Parts of the World

THE SECOND MILE

by

W. E. Wickenden

At the Annual Meeting of the Institute in Hamilton in 1941 the speaker at the Banquet was the late Dr. William E. Wickenden, then president of Case School of Applied Science. His address set forth, in inspiring terms, a creed for engineers which will live as long as the profession itself.

The course of the profession and its voluntary and regulatory organizations is a matter of concern to engineers who regard professional status as more than an instrument for material reward. Because "The Second Mile" is as appropriate a guide today as it was in 1941—because its clarity and value are multiplied with each new reading—and because no engineer with a spark of professional consciousness in his makeup can read it without pondering the course he is following personally, the Publication Committee has recommended its presentation for a second time in the *Journal*.

Each member should read it—carefully, thoughtfully, and with an effort to capture something of the presence and stature of the engineer from whose ideals it sprang. Dr. Wickenden was a great engineer and, to the extent that engineers govern themselves by the creed set forth in "The Second Mile", so too will they be great engineers.

"Whosoever shall compel thee to go one mile—go with him twain." I am not sure that I should dare to choose this as a text for a talk to engineers, such is the present state of our biblical illiteracy. However you will recognize it from the Sermon on the Mount as a counsel of perfection, good advice in the form of a paradox which emphasizes a profound truth by an apparent denial of common sense.

A preacher, who was reproached for straying rather widely from his text, replied "A text is like a gate, it has two uses; you can either swing on it, or you can open it and pass through." Let us pass on through.

Every calling has its mile of compulsion, its daily round of tasks and duties, its standard of honest craftsmanship, its code of man-to-man relations, which one must cover if he is to survive. Beyond that lies the mile of voluntary effort, where men strive for excellence, give unrequited service to the common good, and seek to invest their work with a wide and enduring significance. It is only in this second mile that a calling may attain to the dignity and the distinction of a profession.

Is Not Every Occupation a Profession?

There seems to be an illusion abroad that any calling may claim recognition as a profession by merely willing it so and by serving notice to that effect on the rest of the world. It is supposed to help a lot, too, if you can invent for your occupation some mysterious-sounding name derived from the Greek. One reads, for example, of a group of barbers who elect to be known hereafter as "chirotonsors," in order to raise the prestige of their "profession." Why not, when you have cosmetologists right in the same shop? The truth seems to be that as soon as any word acquires a halo of distinction, every one wants to claim it, and the unique value of the word is quickly destroyed by indiscriminate usage. When one scientist observed what the advertising fraternity has done to the word "research," he remarked dryly that we now use that word to mean so many things we shall soon have to invent another word to mean research. The ambition to dignify honourable work is laudable, but there is much seizing after the form and letting the substance escape, which would be ludicrous if it were not pathetic.

A prominent English churchman once remarked facetiously that there were three sorts of Anglicans—the low and lazy, the broad and hazy, and the high and crazy. It seems to be much the same among engineers in our thinking about our profession. We have a low church party which holds that status and titles are of little consequence; so long as the public allows us to claim them not much else matters if the engineer does an honest day's work. The broad church party is all for inclusiveness; if business men and industrialists wish to call themselves engineers, let us take them in and do them good, not forgetting the more expensive grades of membership. The high church party is all out for exclusive definitions and a strictly regulated legal status; in their eyes, what makes a man a "professional" engineer is not his learning, his skill, his ideals, his public leadership—it is his licence certificate.

What Professions Have In Common

Of professions there are many kinds; open professions like music, to which any man may aspire within the bounds of his talents, and closed professions like medicine which may be entered only through a legally prescribed process; individual professions like painting and group professions like law, whose members constitute "the bar," a special class in society; private professions like authorship and public professions like journalism, artistic professions like sculpture and technical professions like surgery; ameliorative professions like the ministry and social work, and professions which safeguard social institutions through a technique of destruction, like the army and navy. Despite all these differences of pattern, certain characteristic threads run like a common warp beneath the varying woof of every type of professional life and endeavour.

If one searches the authorities for definitions of a profession he will probably find four kinds. One is likely to hold that the determining quality is *an attitude of mind*, that an altruistic motive can lift any honourable calling to the professional level. A second may say that it is a certain *kind of work*, one requiring special skill on a high intellectual plane. A third may state that it is a special *order in society*, as the bar, the bench or the clergy. Still others insist that no work can be professional without a *confidential relationship* between a client and his agent, as that of patient to physician, litigant to lawyer, etc. None of these definitions is self-sufficient. Taken together, like the legs of a table, they give a profession a stable base of support.

The Individual and the Group

Suppose a man were to say, "I'll be a professional, but I'll do it by myself; I hate organization dues and duties." One would be tempted to reply, "So you'll take the head, without the body which nourishes it." Or suppose another were to say, "Oh! I'll join all right, but I'll never do anything about it," to which a fair answer would be, "So you'll grasp the form and let the substance go." Full professional life can not be achieved in isolation; like religion and the church, it needs a culture medium in which to grow and flourish. Some aspects of professional life are essentially individual, while some are essentially group relations.

What is the distinctive mark of the professional man? First, we may say that it is a *type of activity* which carries high individual responsibility and which applies special skill to problems on a distinctly intellectual plane. Second, we may say that it is a *motive of service*, associated with limited rewards as distinct from profit. Third, is the *motive of self-expression*, which implies joy and pride in one's work and a self-imposed standard of excellence. And fourth, is a conscious *recognition of social duty* to be fulfilled among other means by guarding the ideals and standards of one's profession, by advancing it in public understanding and esteem, by sharing advances in technical knowledge, and by rendering gratuitous public service, in addition to that for ordinary compensation, as a return to society for special advantages of education and status.

Next, what attributes mark off the corporate life of a group of persons as professional in character? We may place first *a body of knowledge* (science) and of *art* (skill) held as a common possession and to be extended by united effort. Next is *an educational process* based on this body of knowledge and art, in ordering which the professional group has a recognized responsibility. Third is *a standard of personal qualifications* for admission to the professional group, based on character, training and proved competence. Next follows *a standard of conduct* based on courtesy, honour, and ethics, which guides the practitioner in his relations with clients, colleagues and the public. Fifth, we may place a more or less formal *recognition of status*, either by one's colleagues or by the state, as a basis for good standing. And finally, there is usually *an organization* of the professional group, devoted to its common advancement and its social duty, rather than to the maintenance of an economic monopoly.

How Professions Came Into Being

The traditional professions of law, medicine and divinity had a common fountainhead in the priestcraft of antiquity. What is professional in modern technical callings such as engineering can be traced back only as far as the mediaeval craft and merchant guilds, which arose out of the breakdown of feudalism. Before strong central and local governments were developed to lend the protection of army or navy to far-flung commerce, voluntary groups of merchants had to band together for their own protection, as in the cities of the Hanseatic League along the shores of the Baltic Sea. The various crafts likewise found it necessary to join together in guilds for mutual protection and regulation. If you have an opportunity to see a performance of Wagner's opera *Die Meistersinger* you will not only hear much magnificent music but also witness an unforgettable picture of guild life in its mediaeval home.

There being no other effective authority, the guilds took over the regulation of the hours of labour, the observance of holidays, the length and content of apprenticeship, the wage system, the standards of workmanship and the quality of goods. The guilds also tested the progress of novices, apprentices and journeymen, and finally admitted them to the ranks of the masters with imposing ceremonies, of which college commencements and inaugurals are the most picturesque survivors in our modern day.

The guilds naturally took unto themselves considerable monopolies and privileges. As the cities gradually grew strong they usually recognized the guilds and gave them a considerable share of civic responsibility. To this day The City and Guilds of London are a single corporate unit. The church, too, lent its blessing in keeping with a philosophy which looked upon society as a commonwealth divided into divinely ordained functions and not as a mere aggregate of individuals. In short, guild life became a highly developed form of citizenship which centred around occupations rather than politics.

Many features of this distinctive type of citizenship are perpetuated in our modern professional bodies. The public grants to a profession more or less tangible monopolies and self-governing privileges, in consideration of which the profession engages to admit to its circle only men of proved competence, to guarantee their trustworthiness, to insist on the observance of ethical relations and practices, and to protect the public against bungling and extortion.

What a Profession Must Guarantee

The self-policing responsibilities of a profession in our modern world arise in large measure from the fact that so many of the occasions which call for professional service are human emergencies in which the usual axioms of business, such as "competition is the life of trade" and its legal doctrine of *caveat emptor*, "let the buyer beware," simply break down. When a baby is about to be born or an appendix must be removed, you do not want to drive a smart bargain at your own risk. What you want are credentials that will assure you that the job is in competent hands.

When a layman comes face to face with the complex and often terrifying specialization of professional skill and knowledge, he is likely to be baffled or easily misled. If you have a problem of mental illness in your family, how can you be sure you are dealing with a qualified psychiatrist and not with a plausible but unscrupulous quack? To protect you in these emergencies the public wisely puts the burden of guaranteeing at least minimum standards of competence and ethics on the profession itself. The physician you can trust is the one who is recognized as well qualified and reputable by his brother physicians of good standing; the same with lawyers, dentists, architects and engineers.

The state may implement the obligation of a profession to guarantee competence by designating a group of its members to conduct professional examinations and to issue public licences to those who pass them successfully, or it may leave professional bodies free to issue their own credentials. Both of these practices may exist side by side, as in the realm of medicine, where the state licenses general practitioners through a board of examiners, while the various groups of specialists have voluntary organizations which examine and certify physicians seeking recognition in their respective fields. In the end, it comes down to the same principle—a profession must guarantee to the public the trustworthiness of its practitioners. In return, the public protects the profession from the incompetent judgment of the layman by a privileged position before the law.

Is Technical Skill Enough?

Professional status is therefore an implied contract to serve society, over and beyond all specific duty to client or employer, in consideration of the privileges and protection society extends to the profession. To possess and to practise a special skill, even of a high order, do not in themselves make an individual a professional man. Mere technical training, at any level, is vocational rather than professional in nature. The difference between technical training and professional education is no simple matter of length—any difference of two years, or four, or six; nor is it a mere matter of intellectual difficulty. It is rather a matter of spirit and scope. More specifically, it can be described as an overplus beyond the knowledge, however intricate, a man needs to master his daily tasks.

A surgeon, for example, needs to be extremely skilled in tying knots, which he learns with the other skills of his craft by technical training and prolonged practice, but the overplus in his education which marks him as a professional man is the long process of study, observation and reflection which gives him deep insight into the human organism and its hidden forces of disorganization and recuperation. Professional education for the lawyer means more than training him to draw contracts, or to draft wills and trust agreements, or to prepare briefs and try cases. It means also the study of the history and philosophy of human relations and social institutions out of which the law has grown as a deposit of the age-long experience of mankind. Likewise for an engineer, technical training aims at skill in applying mathematics and the physical sciences to concrete problems of design, construction and operation, but professional education looks beyond to philosophic insights into the relations of mathematics and science as modes of universal human experience and to competent understanding of the social and economic forces set in motion by technological achievement.

The overplus in professional education, in short, is that which enables a professional man to view his work not only as a skilled service to a client, but also in terms of its consequences for society. An engineer, for example, develops a labour-saving process and recommends its adoption; does he see in this act only an immediate saving in the cost of production, and assume that this is adequate justification in itself? Or can he perceive the sequence of effects which will be felt in the lives of individual workers, of the organization which employs them, of the community in which it functions, of the markets which it supplies, and of the wider sector of society which it ultimately serves? In the answer to these questions there is wrapped up much of the difference between a high-grade technician and an engineer of true professional stature. Every professional body counts on its rosters many men who are little more than technicians, and it is well that they are included since professional development comes so largely through association and indoctrination. But no professional body can be strong and effective unless it contains a substantial nucleus whose intellectual attainments far exceed in depth and breadth the technical demands of its practice.

Professional Obligations

The ethical obligations of a profession are often embodied in codes and enforced by police powers. Even when no written canons exist, as in the artistic professions, unwritten usages and standards exercise a powerful guiding and restraining influence. The physician and the lawyer are bound by explicit obligations. Each must keep inviolate his client's confidence, serve his client's interests exclusively, and stay within strict bounds of procedure. Woe betide the man who oversteps these obligations; if the courts do not deal with him the organized profession will. As engineers, our codes are less tangible and the means of enforcement less explicit, in proportion as our duties are less definable, but our ethical obligations are no less binding morally.

Codes and police powers alone do not suffice to sustain the personal and corporate obligations of a profession any more than statutes and courts alone can assure the healthy life of a community. Equal importance attaches to the state of mind known as professional spirit which results from associating together men of superior type, and from the adherence to a common ideal which puts service above gain, excellence above quantity, self-expression above pecuniary motives and loyalty above individual advantage. No professional man can evade the obligation to contribute to the advancement of his group. His skill he rightly holds as a personal possession and when he imparts it to another he justly expects a due reward in money or in service. His knowledge, however, is to be regarded as part of a common fund built up over the generations, an inheritance which he freely shares and to which he is obligated to add; hence the duty to publish freely the fruits of research and to share the advances in professional technique. If the individual lacks the ability to make such contributions personally, the least he can do to pay his debt is to join with others in creating common agencies to increase, disseminate and preserve professional knowledge and to contribute regularly to their support. That is the purpose to which a large share of the membership dues of our professional societies is devoted.

Too many engineers exhibit an unenlightened and petty attitude on these matters; mature men who complain that the direct returns to them of the researches and publications of a professional society are not worth the annual fee, and young men who grumble because membership does not lead to direct preferment in rank and salary. Shame on us! Do we look with envy on the high prestige of medicine or surgery? Then let us not forget that this prestige has been won not merely through personal skill and service, but not less through magnificent contributions to human knowledge without profit to the seekers and with incalculable benefits to all mankind. Do we covet leadership on a par with the legal profession? Then we do well to remind ourselves that a profession exceeds a technical vocation in that measure of personal development and powers of leadership which fit men for places of influence in the community.

Marks of Retarded Professional Development

Measured by standards such as these, many men who call themselves engineers and who have proved themselves competent in accepted technical practices, have not attained a real professional stature. Some are victims of a deficient education, not in the sense that school and college failed to teach them all they would ever need to know, but rather failed to inculcate a taste and a capacity for continued learning under self-direction. They are usually the men who have let their scientific training slip away after they have mastered a specific job, who have been unable to surmount the routine of early experience and have gradually grown content with mediocrity. Some of the difficulty may be inherent in the operating routine so often associated with an engineer's work. There is much in the daily work of a physician, a lawyer, or a minister of religion which compels him to be a life-long student. In peacetime, the young army officer is likely to spend an average of one year in six going to school. The student habit is less often a mark of the engineer, and in some degree this is but natural to the man of action as distinct from the man of reflection, but far too many are content to leave all growth after their college days to the assimilation of ordinary experience, without sustained intellectual discipline of any kind. If these deficiencies exist, they are not solely a reflection on the individuals involved, but also on the professional body. One of its obligations to its younger members is to give effective stimulus and guidance to their growth.

Why Not Require Longer Training?

There is a school of thought which has two quick and ready remedies for all the ills and shortcomings of the engineering profession. One is to keep the boys longer in college and to compel them to cover courses in both liberal arts and engineering. The second is to limit strictly the use of the title "engineer" to men who have obtained a public licence. One need not quarrel with either the aims or the means; so far as they go both are good, but they cover only the first mile.

Registration will probably always be a qualifying standard rather than a par standard for the engineering profession. By its nature, it cannot be a standard of distinction. It will go far toward keeping the wrong men out of the profession, but it will serve only indirectly to get the right men in. Beyond it lies a second mile of growth and advancement for which effective guidance, incentives and rewards can be provided only within the profession itself.

The proposal to compel all engineering students to remain six years or more in college in order to complete combined courses in liberal arts and in engineering is attractive in theory but unworkable in practice. Some young men should do so, but the majority will not. Those who do are likely to find that the advantage gained comes quite as much, or even more, from sharing the life and spirit of two divisions of education with differing ideals and traditions, as from a more extended range of studies. The advantage of breadth, so gained, must be weighed against the depth which might result from devoting the same length of time to a combination of undergraduate and postgraduate training. No combined programme in arts and engineering requiring more than four years can be made compulsory in the face of the demands of industry, the attractive terms offered to four-year graduates, and the wide range of engineering responsibility, nor is it likely to succeed so long as the typical student engineer, as graduation approaches, shows so unmistakably that he is fed up for a time with formal teaching and study and craves action and experience.

Much has happened in late years to strengthen the belief that possibilities in the mile of voluntary advancement are more hopeful than any lengthened mile of compulsory discipline. Growth in postgraduate enrolments in engineering colleges in the prewar years was especially impressive, with the ratio of master's to bachelor's degree rising above one to ten and that of doctorates nearing one to a hundred. What was particularly noteworthy was that so many of these advanced students were pursuing interests and needs which they had discovered for themselves in their early professional experience, rather than a further discipline — however ideal — which others had imposed upon them.

Does an Engineer Need His Profession?

The engineer needs his profession for his personal advancement. That is the purpose which brought it into being.* He needs it most at the beginning of his career. Perhaps you have heard the wisecrack on the bringing up of the American boy, "When my father and my mother forsake me, then the Boy Scouts will take me up." Just substitute *alma mater and professional society* in the right places. Young men need for their advancement wider sources of information, more varied personal associations, broader stimulation to achievement and less formal contacts with their seniors than they usually find in their daily jobs. They also need earlier outlets for their organizing and executive

* The first professional society, *The Institution of Civil Engineers*, was organized in London. The official account of its founding begins, "It was toward the end of the year 1817 that a few gentlemen, then beginning life, impressed by what they themselves felt were the difficulties young men had to contend with in gaining knowledge requisite for the diversified practice of engineering, resolved to form themselves into a society."

abilities — something on a pilot plant scale like the campus activities of college life. They can gain much from outside recognition. As men mature they come to value professional rewards—friendships, recognition, responsibility, pride in belonging, evidences of distinction, etc.—no less and often more than money rewards. These are the durable satisfactions of life.

The engineer, in a society based largely on group relations, needs his profession to safeguard his occupational and economic welfare. He needs protection against unethical competition, against indiscriminate use of the title "engineer," and against all influences which might undermine public confidence in his integrity and competence. He needs protection against those who assume that he is "just another employee" and against sub-professional groups seeking to act for engineers in the process of collective bargaining. He needs protection against the levelling influences of unionism and of civil service. He needs the benefits of prestige built up through group publicity. He needs a collective instrument for shaping public policy in the realm of his responsibility. It is true that a professional organization is primarily a moral agency and not in itself an economic or political pressure group, but in the long run moral agencies are the more powerful and enduring.

The engineer needs his profession because of his stake in the advancement of knowledge and technical skill. Who has a larger stake, and who stands to gain more through pooling of effort? The ancients washed occasional nuggets of useful knowledge out of the gravel of common experience by individual placer mining, but science began to get on only when men organized agencies to collect, preserve and disseminate knowledge and to mine the hidden veins systematically. Otherwise, there would be no profession of engineering. Industrial research, invention and the patent system, with all their incalculable benefits, tend to canalize knowledge and know-how in restricted channels. The general interest and professional advancement alike require that the reservoir of free knowledge, stored by centuries of untrammelled research, be constantly renewed. Few engineers can do much about it alone. Collectively their capacity to advance knowledge is beyond calculation.

Most of all that has been set down above has an idealistic base. If one insists on being a Philistine, it can easily be brushed aside with a "So what?" Some consider this the natural reaction of a man who day by day must give hardheaded answers to the questions "Will it work?" and "Will it pay?", and whose work leaves no room for wishful thinking. But look for a moment under the surface. By common consent, the quality most universal and indispensable among engineers is integrity; this is essentially something moral or idealistic. Ranking almost equal with integrity is devotion to duty; given a job, an engineer will see it through, come hell or high water; and so on through the whole catalogue of the engineer's distinctive virtues. Why is he so? Because a boss or a time-clock is policing his efforts? Or a money incentive drives him? Or hoped-for applause urges him on? Well, hardly! Because he has had a soldier-like training and indoctrination? In some small measure. Because he has a tradition to uphold? Yes, no doubt. Or is it because of something within himself to which he dare not be disloyal, and a faith between himself and his colleagues — unspoken perhaps — which he dare not betray?

In matters of social concern is the engineer just a materialist, promising to save civilization by flooding it with gadgets? No more than other men who bear high responsibilities in the industrial order. He is not only an engineer but a citizen, not only an individual but one of a corporate group with a major contribution to make to the common good. Naturally, he has a concern that the prevailing social attitudes and public policies shall favour rather than hinder that contribution. Amid the present Babel of economic confusion he has a message to proclaim in clear and ringing terms —that our economic ills cannot be solved by division until they are first solved by multiplication, that the creation of wealth in a democracy is the job of free enterprise, and that the public has a far greater stake in stimulating technical progress than in policing prices and profits. The dimensions of this issue are no longer national, they are world-wide. Shall the engineer raise his voice from an individualistic soapbox, or through the amplifier of professional organization?

Millions of individual, unrelated efforts will not add up to the future that invites our profession. This is no time for engineers to wrap themselves in the mantle of isolation; let us get together and be about our common business.

A Look Ahead

Let us risk a look into the next 50 years, which our present student engineers are to share in shaping. The climax of man's effort to subdue nature, to shift labour from muscles to machines, to make material abundance available to all, and to extend a high civilization into the backward areas of the world may well fall within their lifetime. After that, perhaps human interest may shift from work to leisure, from production to enjoyment, from economic progress to culture and from industry to art. Who knows? In the meantime, however, it seems inevitable that industry will be extended on worldwide lines, production will grow more scientific, research will expand, and engineers will multiply accordingly.

Engineers will find their way into every field where science needs to be practically applied, cost counted, returns predicted, and work organized systematically. They will be called upon to share the control of disease with physicians, the control of finance with bankers, the bearing of risks with underwriters, the organizing of distribution with merchants and purchasing agents, the supplying of food with packers and purveyors, the raising of food with farmers, and the operation of the home with housewives. In few of these new fields, if any, will engineers be self-sufficient; to be useful they must be teamworkers; and they must be prepared to deal with "men and their ways," no less than "things and their forces."

The engineering profession, it seems equally evident, will bear much heavier responsibilities in civic and economic affairs. It cannot afford to become either a narrow caste of highly skilled technicians or a free-for-all alumni association of engineering graduates. It will probably never be able to define its boundaries precisely, nor become exclusively a legal caste, nor fix a uniform code of educational qualifications. Its leaders will receive higher rewards and wider acclaim. The rank and file will probably multiply more rapidly than the elite, and rise in the economic scale to only a moderate degree.

The engineer's job will be so varied, and will change so fast, and his tools will so increase in variety and refinement with the advance of science, that no engineer can hope to get a once-and-for-all education in advance.

We should cease to think of education as a juvenile episode. We should expect to re-educate engineers either continuously or at intervals throughout their active careers. Once the needed means of after-college education are provided in ample degree the engineering colleges could broaden the scientific and humanistic bases of their curricula, cut down on early specialization, relieve overcrowded schedules, inspire independent work, and show the world the best balanced and best integrated of all modern disciplines.

Competence and Culture

There are undoubtedly some who feel that the cultural and spiritual interests of society are menaced by a greater dominance of technological education. I am unable to share these fears. We of the engineering schools have no quarrel with liberal education. We recognize that there are great numbers of young people whose career purposes come to a focus late rather than early in adolescence and who do well to lay first their foundations of culture and social understanding before attempting to build up some special competence. We believe, however, that there are a great many more young people than are now provided for whose career aims can be brought to a focus late in the secondary period and who will do best to lay first the foundations of competence, then to erect on them a superstructure of social understanding and personal participation in cultural activity. If we were to criticize the traditional emphasis of the liberal arts, we should do so on the ground that the preservation and advancement of culture and social ideals, except for certain highly trained specialists, are not the obligation of a special elite in today's society, but one which rests equally on men and women in all occupations and social groups.

We are not indifferent to culture, save that of the dilettante type. Culture is to us not a form of professional interest, nor the fruit of any form of pose or academic exposure, but the fruit of spontaneous activity which all may share on an amateur basis in that second mile which lies beyond the compulsions of one's economic occupation. Expressional activities—sport, music, writing, speaking, dramatics, and the arts of design—also the reading of books, are flourishing on many an engineering campus today quite as vigorously as in many a so-called liberal college. If destiny is to make our technological institutions responsible in the future for a major stem of higher education, and not merely for some of its specialized phases, I have faith that we shall give a good account of our stewardship.

EDITOR'S NOTE:—This remarkable essay merits the widest possible attention among engineers—the profession will be richer to the extent that the message influences their thought and actions.

The Engineers' Council for Professional Development has published it in quantity in a 6″ x 9″ format. Single copies are 15 cents, lots of 15 to 100 copies are 10 cents and for 100 or more, the price is 5 dollars per hundred. Orders may be placed prepaid with the librarian at Institute Headquarters.

ERRATA

November Issue

In the paper "The Engineer in the Days Ahead" by Dr. C. R. Young, M.E.I.C., on page 749, column 3, the second sentence of the first paragraph should read: "Government, or the direction of large enterprises of any kind, necessitates an appreciation of innumerable forces, resistances, hazards, and threats that can be made only by one whose view is broad, whose knowledge is general, and whose sympathies are catholic."

In the paper "Quebec's Undeveloped Water Powers" by Dr. A. B. Normandin, M.E.I.C., the figures "$200,000" and "$300,000", in the second last paragraph of the paper, should be "$200" and "$300".

The author has also requested that we emphasize his opinion that "the firm power, with proper storage, in the Province of Quebec, is at least 18,000,000 hp." This statement should have been included in the summary on the title page of the paper.

We apologize to the authors and to our readers.

GUIDED MISSILES

by

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A paper presented to the Annual General and Professional Meeting of The Engineering Institute of Canada.
Quebec, Que., May 11-14, 1949.

Editor's Note:
The opinions expressed in the following paper are those of the author and should not be taken as official opinions of the Defence Research Board of Canada.

Defining the different types of guided missiles, the author shows to what use each was put during the recent war. The effectiveness of each type is compared, based on cost of production versus assessed damages. Methods of propulsion are discussed, showing what type gives the greatest range at given speeds.

The rocket motor is described, and an explanation given why it is best at high altitudes or where speed is more important than range. Methods of guidance are compared and limits of accuracy for each type are assessed. Directions in which further research is needed are pointed out. The capabilities and uses of various types of missiles are summarized.

There has been a great deal written in the press during the past two years about guided missiles, push-button warfare, inter-planetary travel, etc., and many conflicting statements have been made. The object of this paper is to clear up a lot of confusion that probably exists in the minds of many people by explaining the fundamental capabilities and limitations of guided missiles, and at the same time, to give Canadian engineers an idea of what would be required of them if Canada had to develop or manufacture guided missiles in an emergency.

First we should know what is meant by a guided missile. For example, there might not appear to be much guidance used in the flight of a German V-2 rocket or of a V-1 pilotless aircraft, and certainly a naval torpedo is not often thought of as a guided missile. However, these examples have two characteristics in common that can be used to define the whole class of weapons that are referred to these days as guided missiles.

Firstly, their paths are controllable by an internal mechanism. The V-2 rocket contained gyroscopes and accelerometers, or radio equipment, to keep it on its path and to control its velocity up to the point at which its propulsion ceased. During this part of its flight, which took about one minute and covered about 20 miles, it was guided. From here on it behaved as an ordinary unguided momentum projectile. In the case of a pilotless aircraft or a torpedo, although its path is straight, it is controlled throughout its whole trip by an internal mechanism.

Secondly, the three examples given are all missiles. That is, they are fired for a destructive effect, and they are completely expendable. Because they are not intended to be used a second time, and are not required to make a return trip from the target, they can be designed "to give their all" in a single one-way trip to the target. In this respect, their design differs from that of a conventional aeroplane which obviously must operate under conservative conditions to permit many round-trips to the target.

This definition does not specify the mode of travel, and, in fact, weapons that travel in the air, in the water, or on the surface are included. An example of a missile travelling on the surface was the German radio-controlled explosive-laden tank that was used in the last war. However, this was not a success because it was so vulnerable to gunfire from the defending troops.

The concept of a guided missile is attractive to military commanders who, for thousands of years, have been striving to increase the range and accuracy of their weapons in order to "get at" the enemy with the least losses to their own forces. In the western world, at least, the lives of men have become more precious from both the humanitarian and the military points of view. We prefer to expend equipment rather than lives. A projectile that can be directed to its target over a long range, or an aircraft that can operate without a crew are steps in this direction.

Different Types of Missiles Compared

In the First World War, the Germans tried to use a guided missile in the form of a controlled bomb. Control signals were sent from the aircraft to the bomb over wires that reeled out from the aircraft. However, this was not a success because the wires tangled, and the aerodynamic control of the bomb was poor. In fact, only with the recent advances in electronics, aerodynamics and jet propulsion, has it become possible to design a successful aerial missile.

The German glide bomb HS 293 was the first successful aerial guided missile. It was used against ships, and was dropped from an aircraft well outside the range of the anti-aircraft fire from the ships. The bomb was controlled up, down, right or left by four types of radio signals, automatically sent to the missile by the position of the control handle or joystick that was operated by the bomb-aimer. The bomb-aimer tried to keep the bomb continually on his line of sight to the target during its glide. He was successful about once in every five attempts. This degree of success was about ten times greater than with conventional unguided bombs under similar conditions. Three German planes carrying these glide bombs sank seven destroyers in a period of two days during the Dodecanese Islands campaign.

The Germans were also successful n their use of their X-1, which was a radio-controlled high angle bomb. Three bombers scored three hits on the Italian battleship *ROMA* with the X-1 bombs and the ship sank in 30 minutes. Shortly after this, the United States Army Air Force began using its high angle controlled bomb known as AZON against railway bridges in Italy.

In June, 1944, the Germans launched their first V-1 pilotless aircraft against London. In a three-month period, a total of 8,205 missiles were launched, of which 30 per cent landed in the London area. By September, 1944, the anti-aircraft guns and the fighter aircraft were shooting down 80 per cent of them. The missile had a maximum range of about 150 miles and carried 1900 pounds of high explosive in its warhead. Half of the missiles landed within a circle of about 10 miles radius.

In September, 1944, the Germans fired their first V-2 rockets against London. Their maximum range was about 200 miles, and they carried a warhead containing about 2,000 pounds of high explosive. Their accuracy was better than that of the V-1 missiles, about half the rounds falling within a circle of seven miles radius.

Comparative Effectiveness

There is a difference of opinion over the effectiveness of the V-1 and the V-2 weapons, — not in respect of their use by the Germans, which certainly was a success, — but in respect of their effectiveness in future warfare. The objections are (1) 75 to 95 per cent of V-1 missiles can be shot down by modern anti-aircraft fire and fighter aircraft, and (2) the V-2 is expensive to manufacture and to fire at any appreciable distance from the point of manufacture.

Following are the results of an economic analysis of the effectiveness of these weapons as used against England; *The "V-1"* — Cost to Germans, — to produce — $700, to transport and fire, — $300 or a total of $1,000; Cost to us, — material damage — $10,000 per launching; lives, — 0.8 + 4 injured per launching; defence, — 100,000 troops, 375 HAA guns, 575 LAA guns, 500 S/L's, RAF fighters, radar warning, etc. Therefore, in material damage alone, the Germans achieved a 10 to 1 economic advantage. In addition to this, there was the terrific cost to us in lives and defences. The above results were obtained with an average of one missile out of 3 missiles launched reaching the target area. Even if only one missile out of ten or twenty launched were to reach the target, it would appear that there would be a decided advantage on the side of the attacker.

The "V-2"—Cost to Germany,— to manufacture, $10,000; to transport and fire, —$2,000; or a total of $12,000; Cost to us, — material damage $20,000 per rocket set up; lives, — 2.8 killed and 12 injured per rocket set up.

The advantage to the user is likely to increase in the case of the V-2, because improvements in its design will reduce the number of failures at launching and increase its accuracy, and at the same time there appears to be no defence against it. Obviously, no figures are necessary to indicate the effectiveness of a V-2 type of missile carrying an atomic warhead.

Fundamentals

In order to look to the future capabilities of aerial guided missiles, the technical fundamentals on which they operate should be examined. These fundamentals can be considered under three headings.

(1) *Methods of Propulsion:* We want to propel the missile at the highest velocity over the greatest distance.
(2) *Methods of Guidance:* We want to guide the missile to its target with the greatest accuracy.
(3) *Aerodynamic Considerations:* We want to design the missile for the lowest possible air resistance or drag, so the job of propulsion will be made easier; we want to provide control surfaces to make the missile respond accurately to the guidance information that it is given; and we might want to put wings on the missile to increase its range.

Propulsion

The characteristics of the different methods of propulsion can be compared on a basis of the greatest range for a given speed. The equation for the maximum range of an aircraft or a missile with wings is

$$R \propto \eta \cdot \frac{(L)}{(D)} \cdot \log \cdot \left(\frac{Wm + Wf}{Wm}\right)$$

where R = maximum range.
η = propulsive efficiency, meaning the kinetic energy given to the missile per pound of fuel consumed.
$\frac{L}{D}$ = Ratio of aerodynamic lift to drag forces for the complete missile.
Wm = Weight of complete missile and payload, less fuel.
Wf = Weight of fuel.

Therefore, for fixed values of $\frac{L}{D}$ and $\frac{Wm + Wf}{Wm}$ the range is proportional to the propulsive efficiency. This efficiency depends on the type of engine and on the speed of the missile, and the following combinations of engines and speeds will give the greatest range.

For speeds below about 300 miles an hour, the conventional piston engine and propeller will give a greater range than any other known method. Between 300 m.p.h. and 450 m.p.h., a propeller driven by a gas turbine will probably give the greatest range. Between 450 m.p.h. and 650 m.p.h., a turbo jet will give the greatest range. At these speeds, the efficiency of the propeller has decreased, and that of the jet has increased. The propulsive efficiency of a jet is at a maximum when the velocity of the gas forming the jet is equal to the forward velocity of the missile. Turbo jet gas velocities are in the region of 1,500 m.p.h. Between 650 m.p.h. and 900 m.p.h., a turbo jet with after-burning will probably give the greatest range. In this method some of the fuel is injected into the exhaust pipe of the turbo jet, where it burns and produces additional mass flow in the exhaust pipe, thus increasing the forward thrust. Above 900 m.p.h., a ram jet will probably give the greatest range. A ram jet or "flying stovepipe" operates in the same way as the exhaust pipe in a turbo jet using after-burning. In the United States, a small ram jet has maintained a speed of 1,500 m.p.h. over a short distance.

So far, we have not considered the pulse jet engine that was used in the German V-1 missiles. This is an extremely cheap engine that operates at a speed of 400 to 500 m.p.h., but its propulsive efficiency is very low. Combustion occurs in a series of pulses at a rate of about 44 per second. There are valves at the forward end of the engine that close during each combustion pulse and open to admit a fresh supply of air between each pulse.

The Rocket Motor

All the engines so far considered have used the oxygen of the atmosphere for the combustion of their fuel, and hence their operation is limited to altitudes below about 50,000 feet. If we require propulsion at much higher altitudes, or if we are primarily interested in speed and not range, the rocket motor is the answer. The rocket carries its own oxygen, in addition to its fuel. The oxygen can be carried in the form of liquid oxygen, nitric acid, hydrogen peroxide, etc. Standard fuels such as gasoline, alcohol or kerosene can be used, or more unusual high energy fuels such as hydrazine or liquid hydrogen might be used. The rocket motor is therefore immediately handicapped in its range performance by the additional weight of oxidant that it must carry. This shows up in the equation for range, in that the propulsive efficiency must now be based on the weight of fuel *plus* oxidant.

This efficiency for a rocket motor is only one fifteenth to one tenth that of a turbo jet engine. However, the rocket motor can provide a greater net thrust (i.e. thrust minus drag) and produce higher speeds than any other type of motor. The V-2 reached a speed of more than one mile per second. Nevertheless, even if the V-2 had wings like an aeroplane, it would only have a range of about 400 miles. An aeroplane of the same shape and carrying the same load, but propelled by a piston engine and propeller, would have a range of about 4,000 miles.

If a rocket is used without wings and fired as a momentum projectile as in the case of the V-2, its range equation is

$$R \propto V^2$$

$$\text{and } V^2 \propto (S.I.)^2 . \left(\log \frac{Wm+Wf}{Wm}\right)^2$$

where —

R is the range

V is the velocity at the end of the propulsion period

$S.I.$ is the $\dfrac{\text{thrust } X \text{ time}}{\text{pounds of fuel and oxidant}}$

The specific impulse depends primarily on the energy contained in a pound of fuel and oxidant, and secondarily on the design of the combustion chamber and nozzle. The range equation shows that the type of fuel and the weight ratio are much more important in the case of a rocket projectile than in the case of a level flight, winged missile.

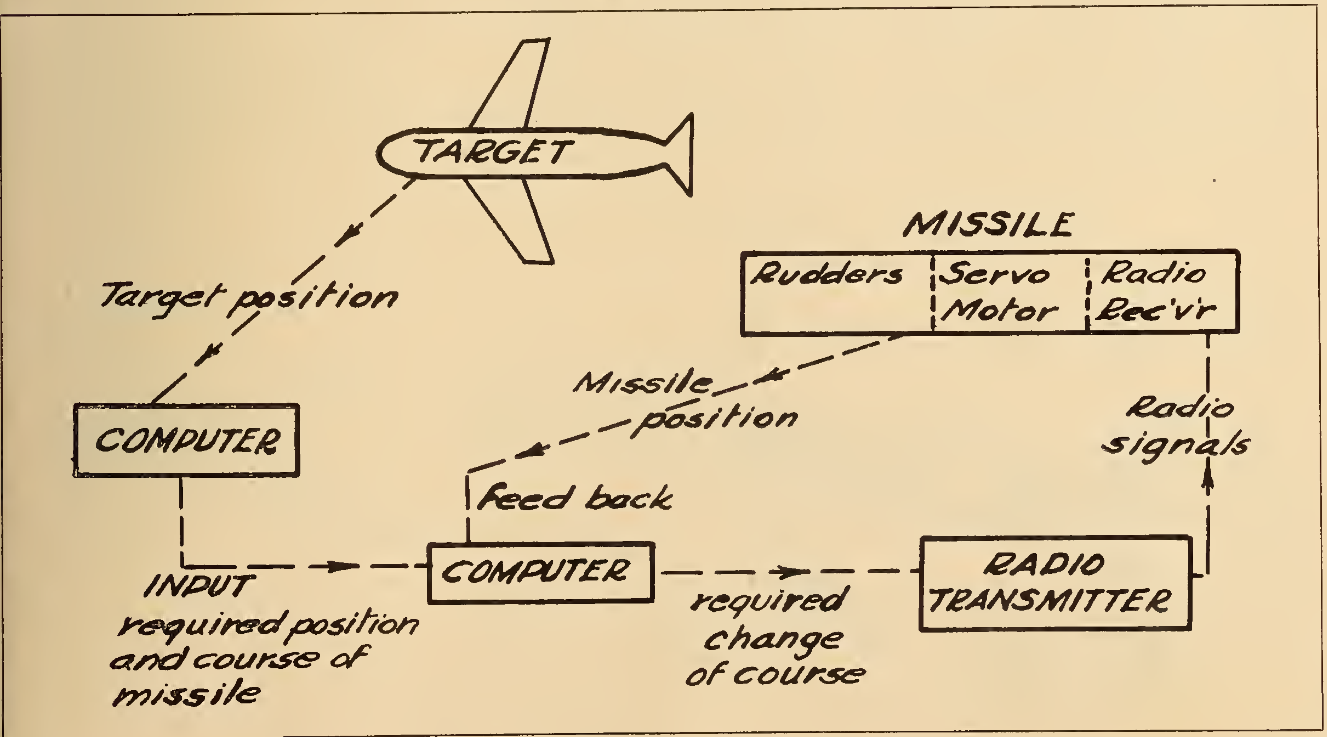
In order to have sufficient range to travel completely around the world, the velocity, V must be about 5 miles per second, and in order to escape entirely from the earth's field of gravity, its velocity must be 7.1 miles per second. Therefore, the $S.I.$, or the weight ratio term must be increased by factors of $\sqrt{5}$ and $\sqrt{7.1}$ respectively, over the present values, to achieve these ranges. These factors might appear to be small, but it should be realized that there has been negligible improvement in useable specific impulse over the past 30 years. In 1919, Dr. Goddard in the U.S.A. obtained higher specific impulses than the highest produced by the V-2 motor. The difficulty is in finding means of using and handling the fuels that can give the higher specific impulses. Combustion chambers and nozzles do not stand up to the severe conditions of erosion and high temperatures usually associated with the higher specific impulses, and the fuels are either too expensive, too dangerous, or too bulky to be of much use.

Although the weight ratio has been improved by using liquid fuel systems and multiple stage rockets, there are rather basic engineering and physical limitations on the improvements obtainable in this direction. The United States Army has announced that a two stage rocket, using a V-2 as the first stage, has been fired to a height of 250 miles. This corresponds to a maximum horizontal range of about 500 miles, or to an equivalent velocity of about 1.6 miles per second. This is still a long way from the five miles per second required to circle the earth, or the 7.1 miles per second required to reach the moon.

Guiding the Missile

The next fundamental aspect to be considered is guidance of the missile. This always requires four phases, namely: (1) locating the target; (2) determining the desired flight path to the target; (3) locating

Fig. 1. Servo Loop in a guidance system



the missile en route relative to this flight path; and (4) telling the missile what changes in course or speed it should make to get on the desired path. These phases of guidance are followed by the so-called control phase, in which a force is made to act on the missile to change its motion in response to the guidance information.

The target can be located from a geographical or magnetic map, by visual observation, by radar, by radio direction-finding, by infra red, etc. The limitations of the visual and radar methods to line-of-sight distances, and the fact that radar can only be used against targets that stand out distinctly against their surroundings, are well known. However, such isolated targets as ships at sea or groups of buildings on flat terrain can be located by a small radar set carried in a missile, and by this means the effective range of operation can be extended to the flight range of the missile.

The flight path is chosen, firstly, to achieve the greatest chance of striking the target and, secondly, to be as favourable as possible to other performance characteristics such as range, time of flight, height to avoid anti-aircraft fire, etc.

Locating the Missile

A surface-to-surface missile can be located during its flight by a radar station on the ground, or it can determine its own position during flight by self-navigation devices such as gyroscopes, accelerometers, star trackers, radio navigation equipment, etc. Locating the missile from the ground is generally quite accurate, but it is usually limited in its range of operation to the line-of-sight distance. However, low frequency radio waves that bend around the earth might be used to extend its range of operation. If the missile locates itself during flight, the range of operation is nearly unlimited, but the accuracy is not good. If the missile carries its own target locator, the accuracy, against suitable targets, can be extremely good. However, in this case the missile must carry all the equipment for the complete guidance process, and the additional weight and cost per missile is an obvious disadvantage.

If the missile is located from the ground, the missile can be told its necessary corrections over a radio channel. Coded signals can be used to provide a certain immunity to jamming. One rather novel method of telling the missile what course to follow is the beam-riding method, in which the missile is designed to centre itself in a radio or radar beam that is continuously aligned on the target. If the beam is, for example, a radar beam that is tracking an attacking bomber, the missile will climb up the centre of this beam and eventually strike, or come close to, the bomber.

The guidance information that is made available to a missile nearly always appears in the form of electrical voltages or currents. These voltages or currents are then fed to a servo-mechanism in the missile that operates the control surfaces on the missile. A servo-mechanism is a system that produces an output, such as position, speed, or acceleration, that is controlled by the difference between the output and the input. This feed-back of output to input in the control process gives rise to the name of "closed loop" systems. The overall guidance and control system of any guided missile is merely an elaborate servo-mechanism. The elements of the system and the closed loop are shown in Fig. 1.

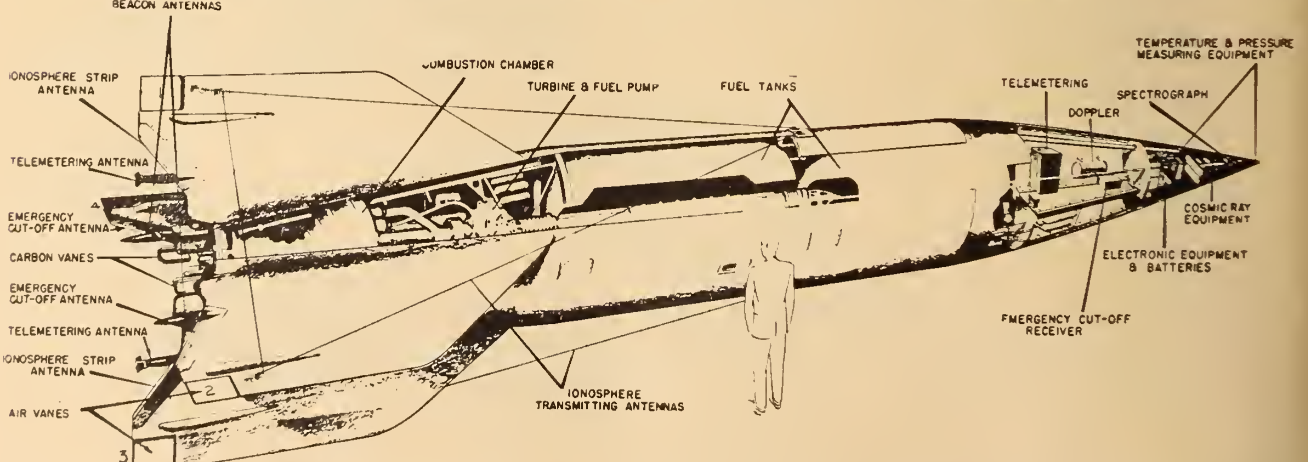
Limits of Accuracy

It is at once apparent that there are many elements and functions in this system, and a correspondingly large number of sources of error in the control. If we want an accuracy of one mile at a range of 500 miles for a rocket projectile, we must keep the sum of all errors contributing to variation in azimuth less than 41 secs. of arc, and we must keep the sum of all errors in velocity control to less than one part in 1000. Some individual components might therefore have to be held to an error of one part in 5000. Because the system is continually readjusting itself to new values of input, the speed of response is very important, and delays in the response of individual components must in some cases be kept to a few milliseconds.

The aerodynamic design of the missile is always directed towards achieving the lowest total drag if it does not use wings, and towards the highest $\frac{\text{lift}}{\text{drag}}$ ratio for the whole missile if it uses wings. For a missile of a given size and shape the drag force increases with velocity at a rate greater than the square of the velocity. The $\frac{\text{lift}}{\text{drag}}$ ratio decreases as the velocity of sound is approached, and, with present theory, can stay constant above this velocity. However, its value in the supersonic range is low, and much more theoretical and practical work is needed to understand and improve on these conditions.

The total drag of a V-2 missile at its highest velocity of a mile a second is about 50 tons at sea level. Obviously, this tremendous air resistance will cause heating of the rocket.

Fig. 2. V-2 equipped for upper atmosphere study. *Official U.S. Navy diagram*



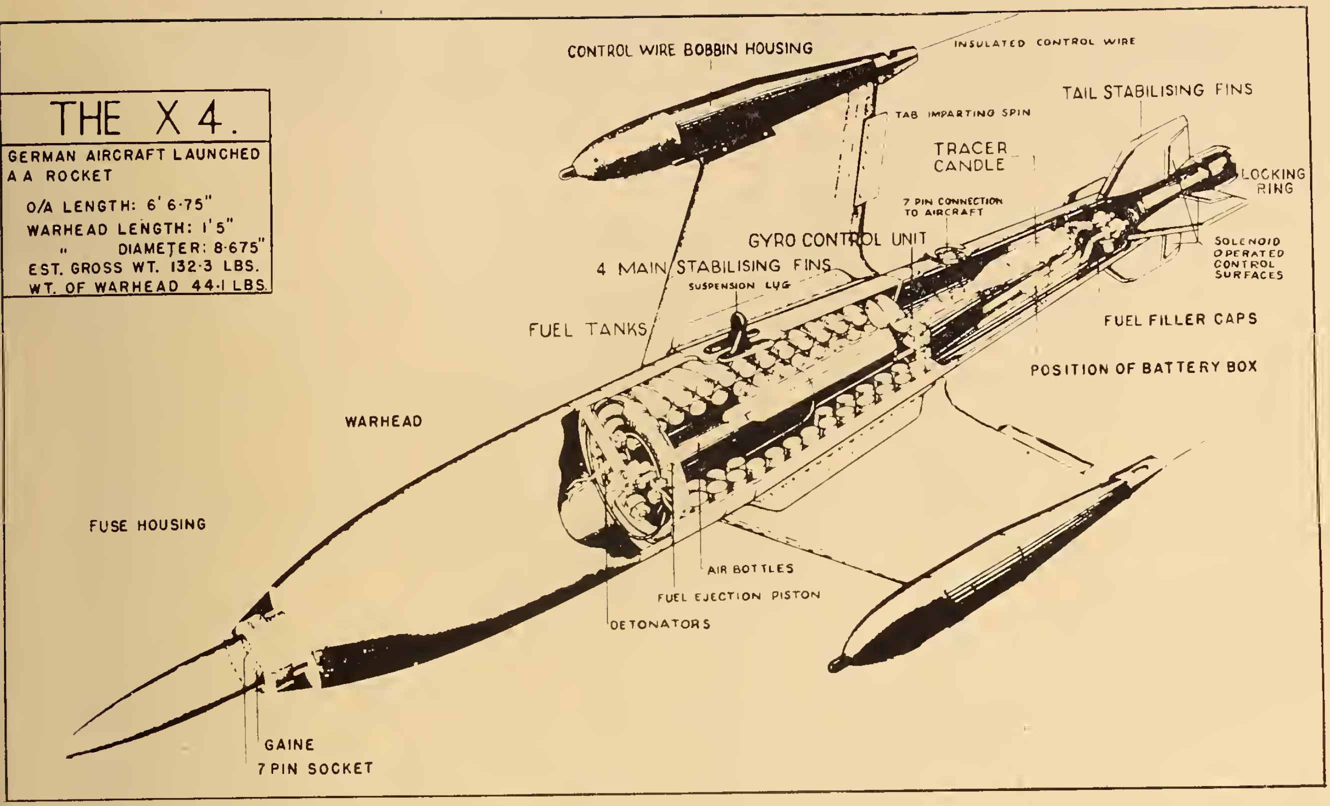


Fig. 3.

Until recently, the accepted theoretical temperature rise under these conditions was about 2000 deg. Fahrenheit, and this seemed to impose another limit on the maximum rocket range that could be achieved within the earth's atmosphere. However, other effects have recently been discovered, and the heating effect is not as severe as originally feared.

Directions in Which Research Needed

The main factors determining the performance of guided missiles have been outlined above. With this background, the subjects on which further research is most needed can be listed as follows:

(a) better fuels and oxidants for rockets,
(b) better materials for rocket chambers and nozzles,
(c) better control of combustion in ram jets,
(d) more accurate methods of guidance over long ranges,
(e) lighter and more compact sources of electrical power for use in a missile,
(f) aerodynamic theory and design data at supersonic velocities.

It can also be seen quite readily that the main weaknesses in the research, engineering, and production potential of Canada are:

(a) Combustion research. (This will shortly be alleviated by the establishment of a Gas Dynamics Laboratory at McGill University.)
(b) Supersonic aerodynamic research. (This will soon be alleviated by the establishment of the Institute of Aerophysics at the University of Toronto.)
(c) Development and production of servo-mechanisms and precision instruments such as gyroscopes, accelerometers, etc. There is no company in Canada that does work like that of Sperry or Bendix in the U.S.A., and, as far as is known, there are not even any courses on servo-mechanisms in Canadian universities.

Conclusions

In conclusion, the main points of this paper can be summarized as follows:

(a) Guided missiles can have a greater range, speed and accuracy than other types of weapons, and their use can save more lives of our troops.

(b) Guided missiles in the air-to-surface and surface-to-surface roles have been proved successful in military operations in the last war, and they would be used on a large scale, including other roles, in any future war.

(c) The longest range missiles will have wings and will fly approximately level at heights not much higher than 50,000 feet.

(d) The highest speed missiles will be propelled by rocket motors, but their range will be comparatively short.

(e) There does not seem to be much chance of shooting a rocket missile around the world within the next ten years, and even less chance of shooting one to the moon.

(f) Targets that stand out distinctly against their background, such as ships at sea or isolated groups of buildings on flat terrain, can be found quite accurately by long range missiles.

(g) The whole system of guidance and control for any missile is an extensive servo-mechanism, and and many of its elements require a high precision in construction and operation.

(h) Canadian research potential has been weak in the fields of servo-mechanisms, combustion problems in jet propulsion, and supersonic aerodynamics. The two latter fields are being strengthened by laboratories at McGill and the University of Toronto.

(i) Canadian engineering and production potential is weak in the fields of precision instruments and servo-mechanisms.

Critical Mineral Shortages

by

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and

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An address delivered at Lake Success, N.Y., August 18, 1949, at a Plenary Session of the United Nations Scientific Conference on the Conservation and Utilization of Resources

The following paper should be of exceptional interest to every member of every branch of the engineering profession. The problems it poses will require for their solution the thought and co-operation of "men of good will" everywhere, under the leadership of engineers.

Though giving assurance that no immediate critical shortages are threatened, the author points out that these are inevitable if present trends of increasing consumption due to population growth and higher living standards for all mankind are not balanced by the discovery of new ore bodies, by improved extraction and processing techniques, by conservation, substitution, and by a wider use of synthetics.

The search for solutions of these problems must be world wide, and based on scientific research. Above all, we must resolve our ideological, national and racial rivalries and hatreds.

I am deeply sensible of both the honour and the responsibility which I accepted in agreeing to prepare a statement on critical mineral shortages for this Conference. It would be difficult to exaggerate the importance of the subject. The significance of minerals in providing the material basis for the economic life and social organization of humanity has long been recognized. Indeed, historians and archaeologists commonly designate the major divisions of human history by reference to the mineral products which were most characteristic of the successive eras. Thus we have the Paleolithic and Neolithic Periods and the Copper, Bronze and Iron Ages.

Contemporary civilization, beyond all preceding experience, depends for its continuance on the minerals which permit and sustain its existence. The growth and concentrations of population, the frequency and speed of movement and transport, the extent and quality of human control over the forces of nature, are all directly dependent upon the discovery and utilization of mineral resources. It is, therefore, of prime importance that we should have as accurate information as can be obtained about the extent of the available reserves in this field.

It will be obvious to all those who have given thought to the subject that a single paper can do no more than outline in general terms the facts of so vast and complicated a subject. However, even generalizations are difficult, because our information is so inadequate. Both scientists and economists have boldly adventured in this field, and many volumes have been written on particular aspects of its problems — especially within the last ten years. But in most cases the result has been simply to underline the conclusion that our knowledge of the facts is so meagre as to make any precise estimate or detailed and dogmatic forecast either impossible or else of most dubious validity.

Opposing Points of View

Estimates have varied widely. At one end there is a strong conviction that new sources of supply and new techniques of exploitation will always keep ahead of human demand. The contrary view is that the standard of life now enjoyed by the more industrialized nations is in danger of early collapse through the exhaustion of essential resources.

Optimistic observers point out that there is today no serious or general shortage of any essential metallic or non-metallic mineral product. They recall the way in which discovery has kept abreast of increasing demand in the past. They argue that new discoveries, combined with increased efficiency in methods of processing and utilization, will be adequate to meet any foreseeable future needs.

Those who take the more pessimistic view rightly emphasize that mineral resources, as contrasted with those of the animal and vegetable kingdoms, are wasting assets; they are not replaceable. Nature has supplied a certain amount of metal and mineral content in the crust of the earth, and when the utilizable portions of this are exhausted, either by waste or by beneficial use, it cannot be restored. The current rates of consumption present an altogether new problem for which past experience gives no assurance of a solution.

Scientists and industrialists agree on the necessity of maintaining an ample supply of minerals and metals if contemporary forms of civilization are to be maintained or if further progress is to be achieved along lines already defined. Iron, copper, lead, zinc, nickel, aluminum, magnesium, and other base metals are by definition fundamental to our way of life. Almost equally important are such alloying metals as manganese, chromium, molybdenum and tungsten, which are essential to the steel industry. The industrial minerals — limestone, sulphur, salt and fluorspar, supply the raw materials for much of the world's chemical industry, while the mineral fertilizers, phosphate rock and potash, are of growing importance in agriculture. Without these, or effective substitutes, large segments of the prospective population of the earth will be condemned to lives of misery and degradation.

The implications of these facts raise a problem so vast and of such universal incidence that in a sane world they would be made the immediate subject of common study and co-operative planning. Unfortunately, the society in which we live is, as yet, very far from having reached that degree of sanity. It is true that some measure of co-operative activity does exist among scientists, and that this could readily be expanded if international political and social conditions would permit. Unfortunately, the current trend would seem to be in the opposite direction. Of this the clearest example is to be found in the difficulties that are being experienced in adapting atomic energy to beneficial rather than to destructive uses. In the race between education and catastrophe, education is falling farther and farther behind.

Unhappy as the situation is, we can derive some meagre satisfaction from such gatherings as that upon which we are presently engaged. Whatever the ultimate results of this Conference, we will at least know that here a co-operative international effort has been made to look at the whole problem of world resources in terms of the general welfare. This Conference may not represent a long step forward, but at least it is not an illustration of the contemporary international practice of walking backwards.

No Immediate Critical Shortages, But . . .

Before commencing a more detailed examination of the problem with which we are faced it would, I think, be well to spend a moment in defining terms. For the purpose of this discussion it is assumed that a "critical shortage" means a shortage of such proportions that the essential needs of the world cannot be met and that the material progress of humanity must, in consequence, be slowed down or directed towards new objectives. I do not include among the "essential needs" the requirements of war. If humanity finds it impossible to avoid war, we may as well assume that we shall be interested in survival rather than in progress. Nor do essential needs include an obstinate adherence to custom or convenience. If a plastic will take the place of a metal in any particular function, the use of metal in that function is not an essential need.

Consideration should not be given to temporary shortages which, like temporary surpluses, may result from changes in the business cycle. It is only by studying the long-term requirements that significant conclusions can be reached. Nor should problems of national self-sufficiency be allowed to intrude. In scattering its beneficence, nature has not taken note of national boundries. It is to be hoped that eventually our economic and political systems can be so adjusted as to ensure an equitable international distribution of minerals and of other resources.

Examined in these terms it is quite clear that there are in the world today no critical mineral shortages. But this temporary condition should not be allowed to induce a false optimism as to the future. The warning signals are flying. In a matter of this importance we cannot afford to do too little; we must not postpone our studies until too late.

Statistics Not Reliable or Complete

As has already been indicated, and as must be constantly recalled, we are hampered in our consideration of this subject by the fact that there are no reliable and complete statistics covering either the extent of our mineral resources or even the rate at which they are being currently consumed. This is true nationally and even more true of the international scene. Consumption fluctuates from year to year in accordance with the industrial activity prevailing in the individual countries and in many of these the statistical information available has only a nominal or shadowy relationship to the material facts. Our difficulties are increased by the particular consideration that there are no recent figures available, except in isolated instances, in regard to either reserves or consumption in the U.S.S.R. Any attempt, therefore, to estimate the world position must be critically viewed in the light of these gaps in our knowledge. Yet in this case ignorance is dangerous.

We do know, with reasonable accuracy, what proportionate amounts of aluminum, iron, magnesium, titanium and other metals are to be found in the crust of the earth. We know, for example, that for every 100 units of lead there are 200 units of zinc, 400 units of uranium, 480 units of copper, 1,000 units of nickel, 1,800 units of chromium, 32,000 units of titanium, 248,000 units of iron, and 400,000 units of aluminum. The "Big Four" of the metal world — nickel, copper, zinc, and lead — are relatively scarce. But this, however interesting, is of little real significance. What is important is the extent to which the various metals are to be found in economically or even in technically workable concentrations. For example, lead, zinc, and tin are rarer constituents of the earth's crust than uranium, although usable deposits of the latter are of much less frequent occurrence than are those of the other three metals. It isn't the quantity, it is the concentration that matters.

Among the reasons for our meagre knowledge of our mineral heritage is the fact that in only a few countries has there been any systematic and detailed geological and mineralogical study of the national domain. Even in the United States of America, where more attention has been given to this matter than in any other country, estimates of available resources are recognized as being little better than intelligent guesses. For example, in 1914, the taxable iron ore reserves of the famous Mesabi range were estimated at 1,386 million tons. In 1947 the reserves were still in excess of 900 million tons, although in the meantime many hundreds of millions had been withdrawn.

Similarly a competent authority in 1945 estimated the proven oil reserves of the United States at a figure more than four times as great as the accepted estimate made in 1915. This was in spite of the tremendous withdrawals during the generation that had intervened. Since that time the great oil fields of the Middle East have been discovered, and promising fields in other areas have been opened. Thus any attempt to estimate the real extent of world reserves of oil becomes an exercise of dubious value. Yet we cannot escape the fact that this resource is being consumed at a rate never before approached in history, and that the rate of consumption is steadily and rapidly rising.

Increasing Consumption

Since the beginning of this century the depletion of our mineral resources has been proceeding at an unexampled rate. Indeed, *the quantity of mineral products consumed between 1900 and 1949 far exceeds that of the whole preceding period of man's existence on earth.* It is a grim commentary on human intelligence that a great proportion of the minerals used during the last five decades has been criminally wasted in the waging of the most destructive wars in history.

The increases in consumption since 1900 have covered all the more important metals and minerals. During that time production of pig iron, lead, and tin has more than doubled; zinc and copper have quadrupled; aluminum, nickel, tungsten and others have shown still greater ratios in increase[1]. A similar expansion has occurred in the use of industrial minerals, while the use of certain metals used in alloys has risen to astronomical heights.

The rate of consumption of any mineral resource is, of course, subject to a variety of influences. Under conditions of free enterprise, mineral deposits are normally exploited only when the margin between the costs of production and the price the consumer will pay will yield a profit to the operator. Obviously, therefore, any improvements in mining, milling or refining techniques that result in lower production costs or in an increase in the percentage of the metal recovered, will correspondingly increase the total of our commercially available resources. The more efficient we become in the utilization of low-grade ores, the more satisfactory our supply position.

The same result can also be obtained in the free market when the consumer is willing or able to pay increased prices. It is only in times of emergency, and unfortunately this usually means in times of war, that the influence of prices becomes insignificant. In such circumstances scientific or technical considerations rather than market influences decide the availability of essential commodities. Finally, the supply position is affected by the accessibility of deposits, the availability of labour and power, and such political factors as taxation and royalties. Significant as these economic factors are, however, they do not affect the over-all position of the extent and variety of our mineral resources — except as they may advance or retard the current rates of consumption.

It is significant that in the cases of agriculture, forestry, fisheries and certain other fields of resources development, some progress has been made in the direction of conservation. All these are renewable resources. Yet in the case of minerals, which are not renewable, there has been practically no effort, except in time of war, to interfere with the free play of a market that is interested only in profits. This anomaly cannot continue indefinitely.

Trend of Future Demand

If we cannot give an adequate estimate of our present resources, we may find some significance in an examination of the certain trend of future demands. If these should, in any instances, expand beyond all likelihood of any comparable new discoveries, that fact will be immediately pertinent to our inquiry.

There are certain basic factors which are clearly distinguishable. The first of these is the rapidity with which the number of human beings on the earth is increasing. Success in the battle against famine and disease is contributing directly to this result. Not only is the population increasing, it is increasing at an accelerating rate. At the present tempo the population of the world will double in less than 90 years. The current increase is approximately 20,000,000 persons per annum, or about 60,000 every day. Even in the length of time occupied in the presentation of this paper over 1,500 more human beings will be born than will have died. In military terms, two new battalions are added to the population of the world every hour of every day.

A second fundamental factor is found in the almost universal demand for a higher standard of living. This will mean, inevitably, an expansion of the demand for mineral products. As an indication of how this might affect the world's mineral resources, a distinguished American scientist recently prepared a study of the consumption of pig iron in the United States, as compared with that in the rest of the world. In 1945 the utilization in the United States was 790 pounds per capita; for the whole world, including the United States, it was 97 pounds, for the world, not including the United States, it was 47 pounds. He then went on to say that these figures deserve careful thought by those who envisage supplies for the whole world even remotely approaching those of the present highly industrialized countries[2].

Consider what would happen if the rate of consumption of iron were to rise throughout the rest of the world to one-half the present rate in the U.S. The total demand — on the basis of the present world population — would be in the neighbourhood of 450,000,000 metric tons per annum. Applying the U.S. experience on the same basis to other metals it is possible to envisage a prospective world demand for 10.9 million metric tons of copper, 8.7 million metric tons of aluminum, 8.3 million metric tons of lead, 6.8 million metric tons of zinc, and 2,480.0 million metric tons of oil.

Demand Likely to Outrun Supply

But the population of the world will not remain static and there is no reason to believe that the people of other nations will be satisfied indefinitely with a rate of consumption only one half that of the U.S. today. *Yet if demand proportions should develop, it would, so far as we now can esti-*

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[1] Under present conditions something over 100 million tons of pig iron, about 3 million tons of copper, 2 million tons of alumium and 1¼ million tons each of lead and zinc are annually required. (This does not include the large and growing consumption of scrap metals.)

[2] Sampson, Edward. "*Some aspects of Mineral Adequacy*". Paper presented at the Annual Meeting, Canadian Institute of Mining and Metallurgy, Montreal, April, 1949.

mate, be greatly beyond the capacity of any known or probable supply.

Increasing scientific knowledge, combined with humanity's desire for a decent standard of living, have resulted in the development of many new uses, not only for the common metals, but for those less known and more rare. Among the latter, attention is now being centred on uranium as a source of atomic energy. But there are also cadmium, calcium, columbium, magnesium, molybdenum, tantalum, and titanium. The last of these is still in its experimental stage of production, but it possesses such inherent physical qualities as to capture the imagination of metallurgist and manufacturer alike. It is as strong as steel, with half the weight and with great resistance to corrosion.

Many of the new advances in man's mastery over nature place additional burdens on our metal resources. Air and automotive transportation, electrical refrigeration, air conditioning, radio, television, and rural electrification are all developments which have greatly expanded the demand for metals. The utilization of atomic energy will require vast increases in the production of steel, copper, lead and the rarer metals.

Within the last two decades the metallurgist has sought to improve the quality of metals for manufacturing purposes by the addition of alloying elements, to obtain greater strength and other desirable properties. Today these alloys are virtually made to the order of the manufacturer and designing engineer. As the research metallurgist gains more and more knowledge of the properties of metals, new combinations of properties will be provided by alloys of the future, each one serving some particular need of industry.

As this science proceeds, the demands for the rarer metals will correspondingly increase. It is here that critical shortages may first appear. For example, in the development of metal alloys to withstand the high temperatures of the jet engine, columbium and cobalt are regarded as essential. Yet not only are these metals rare in the composition of the earth's crust, but economic concentrations are exceptionally difficult to find.

Thus it is quite clear that the combination of an increasing population and rising standards of living will place a strain on our metal resources which will almost certainly in the end prove beyond the capacity of man and nature to supply. It remains to be considered what steps can and should be taken in an effort to prepare for this development.

World Mineral Production 1946

	1946 metric tons	Output of principal nations (percentage of world production).
Aluminum	750,000	U.S.A. 49, Canada 23, U.S.S.R. 12 (est.)
Antimony	24,900	Bolivia 25, Mexico 24, Union of South Africa 10, Hungary, Yugoslavia, China
Asbestos	720,000	Canada 70, U.S.S.R. 14, S. Rhodesia 7, Swaziland 4
Barite	1,100,000 est.	U.S.A. 60, Canada 10, U.K. 10, Germany, U.S.S.R.
Bauxite	4,000,000	British Guiana 29, U.S.A. 27, Surinam 14, France 12, U.S.S.R.
Bismuth	940	Peru 30, Canada 11, U.S.A.
Cadmium	4,049	U.S.A. 57, Mexico 18, Canada 8.5, Australia 5.5.
Chromite	1,110,000	Union of S. Africa 17, Cuba 15, Southern Rhodesia 13, Turkey 10, U.S.S.R. 35(?)
Cobalt	2,860	Belgian Congo 75, N. Rhodesia 17, French Morocco 6.5.
Columbite	1,680	Nigeria 99
Copper	1,860,000	U.S.A. 34, Chile 19, N. Rhodesia 10, Canada 10, Belgian Congo 7.7, U.S.S.R.
Corundum	3,372	Union S. Africa 55, Canada 31, Nyasaland 11
Cryolite		Greenland
Diamonds (metric carats)	10,313,000	Belgian Congo 58, U.S. Africa 12, Gold Coast 8, Angola 7.7, Brazil 3.1
Fluorspar	567,000	U.S.A. 44, U.K. 8.2, Canada 5.4, U.S.S.R., Germany
Gold 1,000 fine oz.	27,777	Union of S. Africa 42, U.S.S.R. 2, Canada 10, U.S.A. 5
Graphite	145,000	Chosen 60(?), Mexico 15, Japan 8, Madagascar 6
Gypsum	10,319,000	U.S.A. 50, U.K. 16, Canada 16, France 4.3
Iron Ore	146,000,000	U.S.A. 49, France 11, U.K. 8.5, U.S.S.R., Germany
Lead	1,166,000	U.S.A. 38, Australia 13, Canada 13, Mexico 12, U.S.S.R. 8.7
Magnesium	11,977	U.S.A. 40, U.S.S.R. 25, Italy 11, U.K. 10
Manganese ore	3,650,000	U.S.S.R. 47, Gold Coast 16, India 10
Mercury	4,800	Italy 35, Spain 29, U.S.A. 18, Mexico 8.4
Mica	64,200	U.S.A. 77, India
Molybdenum	10,000	U.S.A. 82, Mexico 8.2
Nickel	127,000	Canada 68, U.S.S.R. 11, Cuba 10
Petroleum	2,750,190	U.S.A. 63, Venezuela 14, U.S.S.R. 6, Iran 5.3
Phosphate	11,885,000	U.S.A. 59, French Morocco 22, Tunisia 11, Algeria 4.9
Platinum metals (troy ounces)	576,000	Canada 42, U.S.S.R. 30, Union of South Africa 13
Potash (K_2O)	2,240,000	U.S.A. 38, France 23, Germany
Salt	35,545,000	U.S.A. 38, U.S.S.R. 14, U.K. 9, China 6.4, India 6
Silver fine oz.	129,000,000	Mexico 33, U.S.A. 16, Canada 10, Peru 10
Sulphur	4,250,000	U.S.A. 91
Talc	770,000	U.S.A. 54, France 8.6, China, Chosen, Italy
Tantalite	200	Belgian Congo 60, Brazil 22
Tin	90,500	Bolivia 42, Belgian Congo 15, Nigeria 11, Malaya 10, Netherlands E. Indies 7.3
Titanium concentrates	500,000	U.S.A. 52, Norway 13, India 20
Tungsten 60% WO_3	19,000	U.S.A. 25, China 14, Bolivia 11, Brazil 8.5
Vanadium	1,069	U.S.A. 54, Peru 30, S.W. Africa 10
Zinc	1,406,500	U.S.A. 47, Canada 12, Belgium 6.1, Australia 5.6

FOOTNOTE:

The foregoing table does not list all producing countries, but is designed more to show the relative importance of producing areas, the erratic geographical distribution of the commercial deposits, and the consequent interdependence of the nations of the world for essential mineral requirements.

The year 1946 has been chosen since it represents the post-war year for which most complete data is available. It is realized that it does not represent the norm since rehabilitation was far from complete in the war-torn areas. This is particularly true of the tin producing areas. As of 1949 rehabilitation of mines and smelters in Malaya and Indonesia was proceeding at a satisfactory rate. At the last meeting of the Tin Study group in London it was estimated that tin production would exceed the potential demand for commercial uses by the end of 1949.

References:—Mineral Yearbook 1946, United States Department of the Interior Bureau of Mines; Preprints from the Bureau of Mines, Mineral Yearbook 1947.

First Objective—Discovery of New Ore Bodies

It has been said with a great deal of truth that the easy mineral finds have now been made. A review of the discoveries made within the last two decades, particularly in the base metals, reveals only a few of major importance. With minor exceptions, the metals are today coming from areas that were discovered many years ago. Only the intensive work of the geologist and mining engineer in determining the structure and extension of the known ore bodies has lengthened the active life of these mining areas. Other ore bodies, buried beneath glacial or other overburden, undoubtedly exist but their discovery can seldom be accomplished by surface prospecting. The lonely prospector with hammer or pan is today a romantic rather than a significant figure. In his place the contribution of the scientists must be brought to the rescue of the mining industry.

Already much has been done by the physicist and geologist in the use of geophysical methods of prospecting for oil concentrations. The use of the magnetometer, the dip needle and other similar devices is beginning to reveal mineral deposits hidden beneath the overburden, although their results must still be checked by physical means such as diamond drilling.

Probably the outstanding development in geophysical prospecting in recent years has been the airborne magnetometer. By this means a continuous record can be made of the magnetic intensity along the path flown by the plane. This record enables the geologist to determine areas of high intensity such as are usually associated with metallic ore bodies. The results obtained are generally as accurate as those obtained on the ground. Besides, the flying magnetometer has the advantage of speed, since one hundred and fifty miles or more of magnetic profile can be secured in an hour of flying time. Other scientific aids in prospecting for certain ores include ultra violet light, and recently in the search for radioactive materials the Geiger counter has become indispensable.

The greatest hope for fresh supplies of ore depends upon the discovery of new ore bodies in those areas as yet undeveloped. The map of the world shows vast areas of South America, Africa, Northern Canada, Asia and Australia, which have not yet been geologically mapped or intensively prospected. New deposits will certainly be difficult to find, but with our constantly growing knowledge of the geological and allied sciences it may reasonably be expected that many discoveries will yet be made.

Extraction and Processing Methods Must Be Improved

The second step to be taken in our effort to postpone the inevitable date when mineral shortages will develop is the improvement of our techniques of extraction and processing. New and more efficient methods of mining are constantly being sought. In addition, we must continue to broaden the field of research in our metallurgical practices. The record of discovery in this field offers good evidence that further research will result in further refinements. The development of the cyanide process made it possible to recover gold from ores previously regarded as worthless, and thus added immeasurably to the world's reserves of this metal. The change from gravity methods of concentration to froth flotation produced comparable results in the treatment of sulphide ores.

The electrolytic refining of metals has not only increased the purity of the product but has been responsible for the recovery of many new and rare metals as by-products. Cobalt and metals of the platinum group are recovered from the copper-nickel ores of the Sudbury area, while cadmium, bismuth, indium, thallium, and other rare metals have been recovered from lead-zinc refineries. The introduction of dust precipitators and baghouses into the smoke stacks of smelters and roasters has resulted in the reclaiming of large quantities of metals that have been volatilized or vapourized. The development of processes for the manufacture of sulphuric acid from the smelter gases resulting from the treatment of sulphide ores is now established practice. A large part of the world's requirements of magnesium and magnesia are now extracted from sea water, a procedure that was considered fantastic when it was first proposed less than 50 years ago.

These are merely examples of past achievement in a field in which further progress can be confidently anticipated. In the future, as higher grades of ore are depleted, more attention must be given to the

World Production of Basic Metals

(Primary metals in thousands of metric tons)

	1910	1922	1929	1938	1943	1946	1948
							Estimates
Copper	877	904	1,950	2,018	2,757	1,833	2,358
Aluminum	37.9	92.3	281	572	1,941	748	1,542
Zinc	825	719	1,496	1,565	1,828	1,406	1,724
Lead	1,193	1,070	1,474	1,678	1,574	1,161	1,724
Magnesium	....	....	3	24	240	14	18
Nickel	22.5	11.7	56	114	172	127	145
Tin	116.4	122.6	195	161	118	90	136
Total Non-ferrous	3,071.8	2,919.6	5,455	6,132	8,630	5,379	7,647
Pig Iron	66,300	55,640	98,249	82,750	110,768	79,833	108,862
Ratio Ferrous / Non-ferrous	20.9	19	18	13.5	12.8	14.8	14.2

References:—Mineral Yearbook; and Mineral Industry, 1941.

treatment of complex and low-grade ore bodies by leaching or other chemical methods. Further study must also be given to the possibility of obtaining minerals from sea water.

Conservation and Substitution Must Be Emphasized

In addition to the search for new ore bodies and the improvement of our processes of extraction and treatment, greater study must be given to the possibilities of conservation and substitution.

Under the heading of conservation there are two steps of obvious importance. The first is the re-use of metal scrap. Among the more highly industrialized countries scrap today plays a role of real and increasing importance. The chief sources of supply are the obsolescence of manufactured metal products and the waste that results from machining and other steps in fabrication. In the latter case careful segregation and handling of the waste permits its direct return to the melting furnaces. Waiting for metal products to become obsolete is a slower process, but in those countries that have long been industrialized the supplies of obsolescent or obsolete material are playing a more and more important part as a continuing source of metal reserves. In typical recent years scrap provided 49 per cent of the iron, 42 per cent of the lead, 34 per cent of the copper, and 13 per cent of the zinc used in the United States.

The second step in conservation is the prevention of corrosion by the use of preventive coatings of some other metal or of one of the resin compounds, or by the creation of new alloys that resist the corrosive influence of the elements. Much work has already been done in this field, but much more remains to be achieved.

Closely related to conservation is substitution, and this is being achieved in a rapidly increasing variety of forms and instances. Technical developments in manufacturing often permit the substitution of metals that are in plentiful supply for others that are relatively scarce. The use of aluminum and magnesium in transportation and other fields as a substitute for steel is an example of this process. These metals and their alloys have also been applied to many structural and building uses in which strength is not of paramount importance.

The use of aluminum as a substitute for copper in electrical transmission lines has effected a tremendous saving of the scarcer metal. Where lightness is a factor in design, both aluminum and magnesium are being used with marked success in the castings industry. The knowledge and skill of the metallurgist are now being devoted to the introduction of new alloys of these metals that will further widen their use. The supplies of both are relatively abundant. The short supply of tin and its comparatively high price during and since the war have led to reductions in its use and in some cases to substitution in alloys, babbits and solders.

Perhaps the most important developments in the field of substitution are those provided by the industrial chemists who have produced synthetic products that can be used in place of metals in an increasing range of manufactured products. So extensive and successful have these developments been, that an increasing number of chemists are prepared to argue that prospective shortages in the field of metals can be disregarded. They cite the case of the nitrate fertilizer industry and the plastic industry as examples of the alchemy of the future.

In a book written by the chief of the Forest Products Branch of the Food and Agriculture Organization of the United Nations, and significantly entitled "The Coming Age of Wood",[3] the author argues that the material salvation of the world is to be found in a properly

[3] *Glesinger*, "The Coming Age of Wood", New York, 1949.

World Metal Production—New Metal Only

(Thousands of Metric Tons)

Yearly averages over 10 year periods

	1 1901-10	2 1911-20	3 1921-30	4 1931-40	5 1947	6 Peak Year	Ratio of increase Col. 1–Col. 6
Aluminum	18	95	183	383	1,073	1,953 (1943)	1:108
Bauxite Ore	207	599	1,378	2,544	4,200 est.	14,137 (1943)	1:68
Asbestos	74	140	306	380	800 est.	800 est. 1947	1:10.8
Copper	690	1,106	1,368	1,790	2,154	2,718 (1942)	1:3.9
Fluorspar	102	200	260	319	660	1,050 (1944)	1:10.3
Pig Iron	50,000	66,600	65,400	76,770	109,600	137,000 (1943)	1:2.7
Lead M	996	1,107	1,438	1,499	1,167	1,850 (1941)	1:1.86
Manganese Ore	2,211	1,860	2,642	3,928	3,700	5,491 (1941)	1:2.48
Mercury	3,674	3,741	3,947	4,077	4,825	9,480 (1941)	1:2.58
Molybdenum	128	294	832	8,860	10,000 est.	31,300 (1943)	1:244
Nickel	16	35	36	80	138	167 (1943)	1:10.4
Nitrates (Natural sodium nitrate)	1,769	2,510	2,169	1,193	1,400	3,240 (1929)	1:1.83
Phosphate Rock	4,076	5,373	8,830	9,767	12,000 est.	12,000 est. 1947	1:2.94
Potash (K_2O equivalent)	441	972	1,693	2,286	3,000	3,660 (1943)	1:8.30
Sulphur	744	1,155	2,232	2,500	4,300	4,300 est. 1947	1:5.8
Tin	103	127	152	158	116	237	1:2.3
Tungsten (60% WO_3 con.)	3,432	15,335	10,510	25,280	26,000	61,200 (1943)	1:17.8
Zinc	667	881	1,117	1,349	1,540	1,760 (1942)	1:2.64
Salt	15,060	20,630	25,440	31,394	36,000 est.	38,577 (1942)	1:2.56
Mica	4,490	12,003	15,514	23,313	60,000 est.	6,200 (1946)	1:14.3

NOTE:—These statistics are intended to indicate trends rather than absolute figures. They are as accurate as available information permits, but as in many cases, especially in recent years, production figures are not available for all producing countries they cannot be considered to be exact.

managed forest policy. *According to his argument, wood can supply not only hamburg steaks and fur coats but, suitably treated, can also take the place of metal for almost every purpose in which the latter is now used.*

The Use of Synthetics

Without accepting all of the claims of the chemical fraternity, it is undoubtedly true that over a very wide range of use, synthetics can be employed to relieve the pressure on our mineral resources. It must, however, be recognized that chemicals, which in turn are based on inorganic materials, are employed in the manufacture of those synthetic products. Thus, indirectly, the drain on the mineral resources of the world will continue, even though it may be reduced by the use of synthetics.

Moreover, it is probable that there will always be certain cases in which the requirement of high resistance to shock, and other similar specifications, will demand the continued use of metal products. Given the type of civilization that humanity has developed, and that is likely to characterize the future of the race, the demand for metals to be used in circumstances of this kind will certainly continue. Consequently, the use of plastics and other similar synthetic products should now be regarded as an important conservation measure; we can only hope that it will eventually develop into a final substitute.

In this connection, however, it should be recognized that considerable progress has been made in the devising of synthetic mineral products. Prior to the first world war Chile was virtually the only source of nitrate for fertilizers and explosives. The development of a process for the manufacture of synthetic sodium nitrate and ammonium nitrate has reduced the world's dependence upon the natural product, although it is significant that the production of natural nitrate has not appreciably declined. Artificial crystals, artificial mica and artificial graphite have all been successfully produced, and for some uses are even considered to be superior to the natural product.

Perhaps the outstanding development in this field has been the manufacture of the artificial abrasives, silicon carbide and carborundum. These have largely replaced the natural abrasives, corundum and emery, economic deposits of which are relatively rare. Fortunately, the mineral basis of these artificial substitutes, silica, alumina and coke, are in abundant supply. A further example of this kind of substitution is to be found in the development of an artificial cryolite from the use of fluorspar, thus reducing the importance of the natural cryolite upon which the aluminum refining industry depended, and which is known to exist only at Ivigtut in Greenland.

When Will Shortages Develop?

In conclusion we must revert to the theme that has been fundamental to this whole discussion. Our knowledge of the world's supply of mineral products is so meagre and so unreliable as to make it impossible to forecast with any assurance even an approximate date at which we will be faced with a critical shortage of any specific item. *It is clear, as I have already stated, that there is no serious and immediate over-all and irreplaceable shortage of any essential mineral.* But it is equally clear that the demand for mineral products is increasing at such a rate that, unless there is a fundamental change in the economic fabric of human society, we will ultimately be faced with the exhaustion of many of our mineral reserves.

In some cases, particularly lead, cobalt and copper, and probably also iron and oil, the supply will be exhausted more rapidly than in others. New discoveries, improved methods of extraction and processing, and careful conservation will postpone the advent of critical mineral shortages. Substitution may provide alternate solutions. *When shortages do develop, they may not be critical, because alternatives may be available. But this is a hope not a promise.* In the meantime the practices which have used or squandered our mineral resources in the past still continue, and consumption is rising at a rate that can only be described as alarming.

The situation that is thus developing will make heavy demands on human intelligence and good will. Since no one nation has been endowed with all its mineral requirements, the problem crosses every national boundary. The discovery of solutions is a matter of universal concern.

The experience of the two world wars has shown the folly of wasting our irreplaceable mineral supplies in barren struggles that, apart entirely from the moral and social degradation which they produce, end only in general impoverishment and the permanent depletion of our resources. Further conflicts of this kind will hasten the day when real shortages in our reserves will develop. *They may leave us too little time.*

International Co-operation Imperative

Because the problem is a world problem, the search for solutions should be on a world basis. That search can be made infinitely more productive if it is based on an increased appreciation of the necessity for scientific research in this field. There must be co-operation in the exchange of technical and industrial knowledge. Above all, there must be peace. *Given these conditions we can refuse to admit that any material problem is beyond the ultimate competence of mankind.*

If, on the contrary, we hold firm to our ideological, national and racial rivalries and hatreds, if we place on our scientists the bitter burden of the prostitution of their services in war, if we fail to realize the danger as well as the immorality of the irresponsible behaviour that has marked the past conduct of international affairs, humanity will suffer the fate that it has long invited.

The world has entered a new era. Humanity has at last achieved the power of self-destruction. Our record gives no assurance that it will not be used. Surely the time has come to abandon the perversity of war; to devote our talents and our wills to the immensely harder tasks of peace.

If we in this generation are to make our contribution to the solution of the real problem facing mankind, we must be prepared to abandon many customary ways. Our link in the growing chain that binds nature to man's needs must be truly welded if those that follow are to meet the problems of their day. It was never more true than it is today that

"New times demand new measures and new men,
The World advances, and in time outgrows
The laws that in our fathers' day were best;
And doubtless, after us some better scheme
Will be shaped out by wiser men than we,
Made wiser by the steady growth of truth."

Notes on Management

Last month we considered the impact of the return of the buyers' market and how this development was of considerable concern to management in view of the generally increasing vulnerability of profits.

Guessing about what a company's policy on pricing, sales, operating costs, and other matters should be is unsafe at any time—it is particularly dangerous at the present time when, for many companies, even a moderate decline in sales revenue can result in an operating loss unless plans to prevent that development are in operation.

Profit planning is management's effective method of getting the best possible profit under whatever conditions exist. Successful profit planning requires an understanding of the interplay of costs, prices, volume, and net profit, and an accurate appraisal of the effects upon net profit of changes in volume, price, or costs. Some of the broad management policies with respect to these factors were discussed in the October issue of the *Journal* which included the transactions of the Western Hemisphere Conference of the International Committee of Scientific Management. Here it is intended to particularize somewhat, illustrating some of the analytical tools that are available to management.

One of the tools that has gained considerable favour in recent years is the profit-volume ratio chart which pictures the correlation between costs, prices, volume, and profit, thus assisting management in analyzing the results of the past and in planning for better profit in the future. They are especially useful in disclosing fundamental weaknesses in the profit structure and in indicating the required remedies.

A knowledge of the correlation referred to, makes possible quick and accurate answers to many questions of present importance—questions regarding the effects of increasing or decreasing prices or costs; the amount of additional sales volume required to overcome the reduction of profit caused by price reduction; the effects upon profits of increasing or decreasing the volume of sales of different products, or of sales in certain territories or to certain classes of customers.

There are two ways of measuring profit. The conventional way is to deduct from net sales all costs, the remainder being profit. Thus, if total cost amounts to 90 per cent of the net revenue, profit amounts to 10 per cent. Another way to measure or forecast profit is by the use of the profit-volume ratio. Deduct from the sales dollar variable cost only and the remainder is available for fixed cost and profit.

By variable cost is meant the cost that varies directly with volume, such as direct materials and labour. By fixed cost is meant the cost that remains constant regardless of volume, such as building costs, depreciation, overhead, and salaries. If the variable cost is 70 per cent of sales revenue, the remainder, 30 per cent, is the profit-volume ratio. This ratio indicates the rate at which fixed costs are absorbed, and after passing the break-even point, net profits accrue.

There are three ways to improve the profit-volume ratio: increase prices, reduce variable costs, or change the composition of sales to increase the proportions of those items which carry a higher profit margin.

The margin of safety is the difference between current sales revenue and break-even volume. It represents the amount by which sales revenue can decline before an operating loss begins. The soundness of a business depends largely upon the size of its margin of safety. This is its safety valve.

As a simple illustration, let us assume a case in which the pertinent annual figures are as follows:

	($ 000 omitted)	% of sales
Net sales	$12,000	
Variable costs	8,400	70
Income margin	3,600	30
Fixed costs	2,880	24
Profit	720	6
Break-even volume (24/30 x $12,000)	9,600	80
Margin of safety	2,400	20

Fig. 1 is a profit-volume chart based upon these figures.

Fig. 1. Profit-volume chart — (single product)

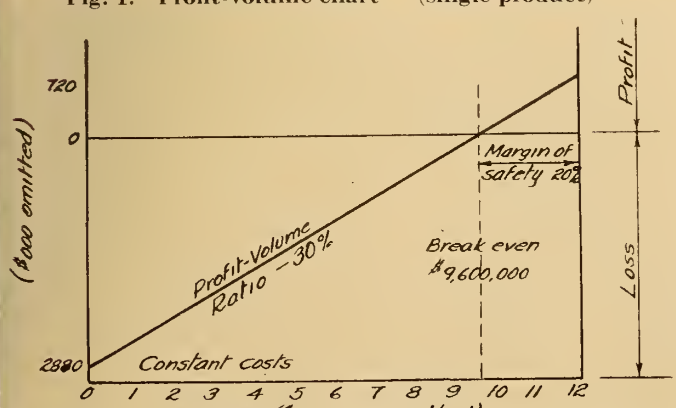
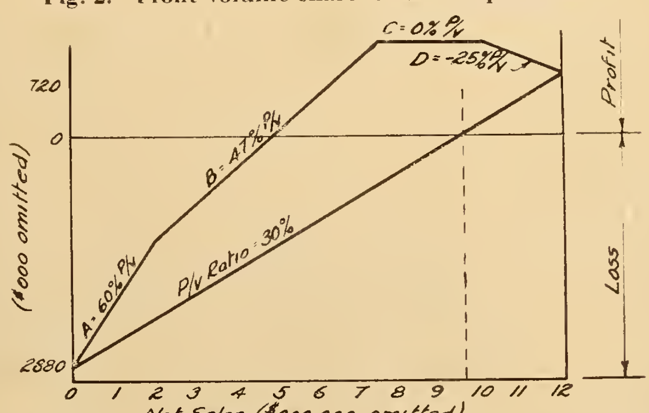


Fig. 2. Profit-volume chart for several products



Illustrative of the use of this chart, it can be seen that the situation visualized is not a particularly safe one. A decline of 20 per cent in sales with no changes in prices or costs will wipe out all profit. An average decline in prices of 6 per cent with no change in physical volume of sales or in costs will have the same effect. With a 6 per cent reduction in prices under conditions as stated, to realize the former profit there would have to be an increase in total sales volume of $720,000 or 6.38 per cent. If prices are reduced 6 per cent and variable costs are reduced 10 per cent, with no change in physical volume or fixed cost, there would be a net profit of $840,000, or 7.45 per cent, a break-even point at $8,732,000 and a margin of safety of 22.6 per cent — a better situation than originally existed.

If, along with a 6 per cent reduction, fixe l costs are reduced 25 per cent, with no change in variable costs, profit on sales would be the same as in the first example, $720,000 or 6.38 per cent, the break-even point would be $8,461,000 or 75 per cent of sales volume, and the margin of safety would be 25 per cent — a safer condition than that shown in the original example.

In most industries, except under abnormal conditions, prices are determined by competition, and are beyond the control of any one company. In many well-managed plants, variable costs are so well under control that no reduction large enough to effect the desired improvement in the profit-volume ratio is possible. A reduction in fixed costs usually takes a considerable time, and may lessen the future ability of a company to keep up with its competition. What then can be done to improve profits without raising prices or changing costs?

A solution is selective selling of the largest possible volume of the products which show the largest profit-volume ratios. In nearly every business there are some sales which are more profitable and other sales which are less profitable than the company average. These differences in profitableness may arise from various causes, especially competitive pressure on prices, excessive selling cost, and the class of customers buying the product. Whatever the cause, it is essential for profit planning that these differences be known.

In the Figure 1, the profit-volume line was a straight line, as if all sales had equal profitableness. But let us assume that an analysis of the profitableness of various classes of sales in the hypothetical case originally referred to shows facts such as the following:

Sales Class	Amount ($000 omitted)	Income Margin ($000 omitted)	P/V ratio (per cent)
A	$2,000	$1,200	60
B	6,000	2,800	47
	8,000	4,000	50
C	2,400	None	0
D	1,600	—400	—25
	4,000	—400	—10
TOTAL	$12,000	3,600	30
Less fixed cost		2,880	
Profit		720	6

This data is visualized in the chart of Fig. 2.

Had all or a larger part of the sales volume consisted of the sales of products A or B. the net profit would have been larger, the break-even point would have been lower, the margin of safety would have been larger. The sales of product C contributed nothing to profit, and the sales of product D reduced the profit realized from the sale of products A and B. The roads for positive action are indicated.

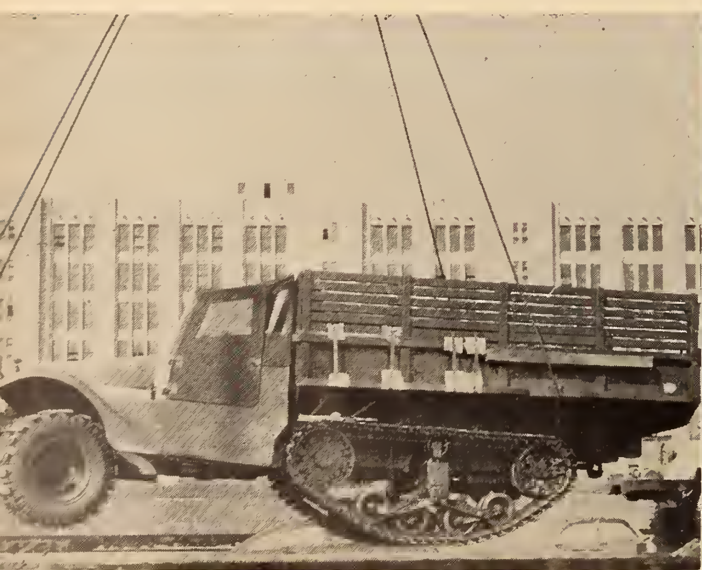
The conventional method of measuring profitableness, which starts with "whole cost", including arbitrary allocations, and arrives at a net profit which is expressed as a percentage of sales (or of cost) is inadequate, and may be dangerously misleading. Yet the measurement of profitability of products, customers' accounts, or sales territories is comparatively simple if the accounting system provides the needed information.

Arctic Transport for the U.S. Army

The U.S. Army Transportation corps recently shipped two of the vehicles shown below to one of its arctic outposts for testing during the coming winter.

These trucks are half-trucks as used by the Tank Destroyer units of World War II. With modifications which are expected to adapt them to operation in heavy snow the Transportation Corps hopes to increase the average speed of heavy transport under winter conditions from some two and one half to fifteen miles per hour.

The photo at left shows one of the vehicles being loaded for shipment to the far north. The second photo is a close-up of the special metal treads for the dual tires which have been fitted to the front wheels.



FROM MONTH TO MONTH

News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

What's Wrong With Canada?

Perhaps that isn't the best title for this article. Maybe it should be "What's Wrong with Young Canadians?" or "What's Wrong with Canadian Institutions?" or maybe just "What's Wrong with the Engineering Institute?" Regardless of the title the subject relates to the action of many young Canadians in relationship to their opportunities, and obligations in Canada.

This outburst springs from what appears to be a tendency on the part of some junior members of the Engineering Institute and other Canadian organizations to resign in order to join or give support to American societies of a specialized technical nature. No one can quarrel with the wishes of a young man to advance his technical knowledge, and no one will dispute the superior technical activities of the great American institutions, but there is more to a society membership than the supply of technical information.

How do these young men expect that the profession of engineering in Canada is going to remain Canadian if they give their support *solely* to American societies? What would happen if everyone followed their example? Supposing all the engineers, doctors, dentists, lawyers, etc. in Canada resigned from their Canadian professional societies and joined the American counterparts. What would become of the Canadian professions? What would become of Canadianism?

There is a lot that a society can do for an individual or a profession beyond the dissemination of technical information. It is possible that these things are more important and will make a greater contribution to the individual's professional development than will the extension of his technical knowledge. A society originating and operating solely in his own country is much better able to do these things for the individual than is an organization of another nation, whose prime objectives naturally and necessarily are the advancement of the group within their own boundaries.

The Americans are a great people doing a great job for themselves and for a lot of others as well. Collectively and individually they are warm friends of Canada. The comments herein recorded in no way offer criticism of American societies. The fault of which complaint is made is our own. It is not the Americans who are pushing the expansions of their activities in Canada, but Canadians.

The presence in Canada of so many sections of American societies could be an indictment of Canadian organizations such as the Engineering Institute. Perhaps if the Canadian organizations had met the needs and wishes of Canadians, the interest in other societies would not have developed—at least not to so great an extent. The officers of American societies are the first to admit this.

It is not difficult to understand how a young engineer is attracted to the great American societies. He is keen on acquiring more technical knowledge in his own branch. There is a glamour about the super

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COVER PICTURE

Last month the *Journal* carried a short account (page 764) of the progress of Avro (Canada) Ltd., in which we emphasized the position of this Canadian organization in the forefront of jet aircraft and engine development.

Avro has now released further figures which testify to the excellence of the Orenda engine which this Company has developed for the Royal Canadian Air Force. It is stated that the third build of the first engine has run more than 750 hours without a major rebuild or overhaul.

The endurance run which has been completed to date has included:

1. 150-hour U.S. Endurance Test Schedule.
2. 25-hour British Ministry Special Category Test Schedule.
3. 150-hour R.C.A.F. Type Schedule.
4. 50-hour Preliminary Flight Rating Test Schedule (Canadian).
5. 150-hour British Ministry Service Type Test for Turboprop and Turbo-jet Engines.
6. 50-hour Preliminary Flight Rating Test Schedule (U.S.).
7. Approximately 175 hours of miscellaneous running, including performance running to simulate engine flight conditions, acceleration trials, and endurance running to measure consumptions.

All of the above tests were carried out at the design rating of the engine, that is, the engine was not derated in any way to achieve this remarkable endurance. Only routine inspection and maintenance was carried out, and the only replacements of any significance were the flame tubes at the end of 300 and 600 hours respectively, and 6 nozzle guide vanes which had become accidentally damaged.

organizations in the States. At college his professor who belonged to one of the societies made complimentary references to it. He may feel that his membership in the specialized society is an outward indication of his attainment in the profession. All this is readily understood, and yet without affiliation with Canadian societies such things may not be in his best interests.

At some point in the student's undergraduate days he should be told more about Canada and Canadian institutions of all kinds, and the desirability — even more, the necessity — of giving support to them. The usefulness of American organizations does not need to be kept from him, but the proper relationship between the two should be explained fully. No complaint is made of his joining an American society, but rather of his failure to support at the same time a Canadian one. He should be reminded that he is a Canadian and as such must live as a Canadian. Among other things this means supporting Canadian institutions. As he is likely to spend his lifetime here, he should be shown that the conditions under which he lives and works depend for their development upon Canadians like himself. He should do his part to develop Canada if he expects Canada to do its part to develop him.

It is an easy thing for Canadians to become almost American in their thinking and action. The good people to the South are so friendly and so kind to us; they do things so well and in such a big way; they are so ready to share their good things with us, that almost without being aware of it we can become at least partially Americanized in our minds. We seem to read American publications of all kinds, in preference to our own. We listen every hour of the day and many hours of the night to American radio programmes and their abundant advertising which by comparison with Canadian style and effort is overpowering to say the least. No wonder young Canadians sometimes get things out of focus.

Canada has a character of its own that is worth preserving, and such preservation cannot be left to a few thinking people who have an appreciation of the situation. We must resist this tendency to slide into the much heralded "American way of life". The Canadian way isn't too bad and is more suitable to us. Let's try to preserve it.

The Engineering Institute is not suffering from this development any more than other Canadian organizations, and the purpose of this article is not simply to salvage memberships for the Institute. It is rather to suggest that something might be done to give our young people a better appreciation of what they have in Canada. There is no better place in the world in which to live and work. How can we get this fact across to that group in which we are particularly interested — the young engineer.

New Branch Sections

Sections of the Saskatchewan and Newfoundland Branches of the Institute, were formed recently in Prince Albert and Corner Brook, respectively.

R. R. Keith, M.E.I.C., of the Saskatchewan Power Commission, has been elected president of the Prince Albert Section, and W. D. Smith, M.E.I.C., of the Provincial Department of Natural Resources and Industrial Development, is its secretary-treasurer. Members of the executive are: J. Jonsson, M.E.I.C., city engineer of Prince Albert; W. S. Paine, M.E.I.C., of the Department of Highways; and W. F. Hayes, of Burns and Company.

At Corner Brook, Eric Hinton, M.E.I.C., of Bowaters Newfoundland Pulp and Paper Mills, Ltd., is president of the Section. G. Tibbo, JR.E.I.C., of Bowaters' Technical Service Department is vice-president; and M. Green, S.E.I.C., also of Bowaters, is its secretary-treasurer

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Annual Report — National Research Council

The thirty-second Annual Report of the National Research Council, recently off the Press, gives the Council's financial statement up to March 31, 1949, and presents in simple language a conspectus of the work of the several laboratory divisions. Copies are obtainable free.

Defining the three types of research, fundamental, applied, and direct industrial research, the report shows how these are allocated to various organizations. The functions of the technical information service are outlined. Inquiries answered during the past year by this service have totalled 4,430 or nearly double the number for 1946.

Atomic Energy

On the Atomic Energy project, the experimental NRX pile has produced the highest flux density of any research pile in existence. The Isotope Branch has distributed 34 different isotopes to 21 institutions for experimental work. Many new plant processes have been investigated by the Chemical Research Branch, and a new Chemical Isotope Laboratory is under construction.

Building Research

The Division of Building Research started its work during the year under review. The setting up of the Division has been warmly welcomed by the industry, and in particular by the Canadian Construction Association with which the Division is now formally associated. In view of current housing problems, the Division has naturally concentrated its attention on questions of building practice in relation to house construction. In this work, it has co-operated closely with Central Mortgage and Housing Corporation, which it is serving in a consulting capacity and as its "research wing". Special technical enquiries are directed to the Division from the Corporation. The work in connection with these has accounted for almost one-half of the activity of the Division during the year.

Two test houses have been built by the Corporation for the Division at the Montreal Road Laboratories. The houses incorporate a number of unusual features and are continually under study while in actual use. A start has been made at a basic study of the construction of houses built without basements. The Division is designing a special laboratory facility to be installed in the Prairie Regional Laboratory at Saskatoon whereby complete wall sections can be tested under completely controlled conditions of temperature and humidity, to be in operation during the summer of 1949. A start has also been made on heating problems, by some actual studies of the heat balance for existing house structures.

A Building Code Conference was held 28 February and 1 March, 1949, under the auspices of the Associate Committee on the National Building Code. A soil mechanics laboratory has been set up and, through this, investigations have been made into variation of soil temperature, house foundation failures, special properties of "clays" from Northern Canada, and other problems. Assistance has been rendered to the Fraser Valley Dyking Board in connection with the soil problems associated with the dykes in the Fraser Valley. Work on snow and ice is being carried out in close association with the Division of Mechanical Engineering.

Pure and Applied Chemistry

Studies are being carried out on photochemical and other kinetic investigations of hydrocarbons, as well as on radioactive carbons, helium, alkaloids, flow of fluids through absorbing media, cation exchange resins, acid dyeing of wool, and many other items listed in detail in the Report.

The Applied Chemistry Branch has collaborated with other government agencies in the drafting of Government specifications, and in the development of testing methods involved therein. Laboratory and field tests of anti-freeze materials have been carried out with the Vehicle Development Branch of National Defence, and the Protective Coatings Laboratory has co-operated actively with C.M.&H. Corp. and with the Division of Building Research, in matters relating to quality control and the inspection of paint and varnish materials.

The Customs and Excise Laboratory has continued to function in its statutory capacity for the examination of commercial products for customs and excise purposes. The various sections comprising the Applied Chemistry Branch have continued to carry on research on a number of projects in the fields of chemical engineering, textiles, corrosion, rubber, protective coatings, applied physical chemistry, industrial organic chemistry, and organic synthesis. These projects are directed mainly towards the application of new scientific knowledge in the chemical industrial field.

Major projects under study defined in detail in the Report include the use of the fluidized bed technique for the recovery of oil from the Athabaska tar sands; work on the mechanism of detergency; the mothproofing of textiles; the high temperature corrosion of heat-resistant alloys; a study of the mechanism of the inhibition of corrosion by silicates and chromates; the evaluation of new anti-freeze materials in regard to the corrosion of cooling systems; purification and chemistry of natural and synthetic unsaturated fatty acids; the solution of problems connected with the use of Canadian produced synthetic rubber; tests of the rain repellent for aircraft windshields.

The main projects under study in the industrial organic chemistry section have been the catalytic oxidation of ethylene to ethylene oxide, the preparation of organic compounds containing stable or radioactive isotopes; and the synthesis of acetylene derivatives.

Mechanical Engineering

The scope of the Division of Mechanical Engineering includes aeronautics and hydrodynamics, as well as phases of mechanical engineering. The Aeronautical Laboratories provide the Canadian aviation industry, both constructors and operators, with research, development and testing facilities, and the laboratories also provide research for the Royal Canadian Air Force. Provision is made for work in almost all fields of aeronautics, including aerodynamics, gas dynamics, power plants, structures, and fuels and lubricants. Basic investigations have included further work on the study of the control and stability of tailless aircraft, in co-operation with the R.C.A.F. After some thirty-six hours of flight trials at Namao, Alberta, during the summer, the tailless glider, designed and built in the laboratories, was towed to Arnprior, Ontario, for further tests.

Other work has included design of supersonic tunnels, conversion of laboratory for jet engine study, icing of turbines, transonic flights, induced precipitation, refrigerated wind tunnel, low temperature laboratory, de-icing, anti-icing, wing tests, self propulsion equipment for model testing basin, fuels and lubricants at low temperatures, snow, and oil burning equipment.

Radio and Electrical Engineering

Fundamental research in radar and radiophysics, and applications of radar techniques to peacetime problems, as well as radar projects for the Canadian Army, have comprised the major portion of the programme.

The development of two electrostatic generators of the Van de Graaff type continued. The five-million-volt generator is being assembled at the Atomic Energy Project for final adjustment and testing. A 500,000-volt machine of similar design is being developed for the Division of Chemistry. Another type of electron accelerator is under development.

Other studies include carbon brush wear at high altitudes, infra red radiation location of faulty power line joints, application of Shoran techniques to geodesy and air photography, meteors, electromagnetic radiation from the sun, effect of snow on radar signals, development of a simple low cost marine radar set, and interference to radar by rain and snowstorms.

Under the headings of Applied Biology, Medical Research and Physics, are listed in the Report numerous and widely diversified activities, which being of less direct interest to the Engineer, are not here repeated in detail. Some thirty committees on special fields of work, on which specialists from the principal interests concerned are serving are established and functioning, 169 scholarships for post graduate studies have been granted, while assisted researches accounted for the expenditure of $724,000 during the year under review.

The Financial Statement records receipts for the year of $8,457,000, with total expenditures for salaries, wages, and allowances of $3,760,000, scholarships $167,000, grants in aid of Research $897,000, and miscellaneous $2,785,000; a total of $7,609,000.








OF
CANADA

Two top photos: **At Hamilton the president's visit was the occasion of a smoker held at the R.C.A. Armouries.**

Upper centre, left: At Hamilton the president presented prize certificates to the student members who read the best papers at the branch student night. Left to right, Frank Dixon; Leslie Galloway; the president; Neil Metcalf, branch chairman; and James Buchanan.

Upper centre, right: The Kitchener Branch gets off to a good financial start as Branch Chairman Montgomery (left) receives from Neil Metcalf a cheque for fifty dollars with the best wishes of the Hamilton Branch. Seated are President Armstrong and Alderman Frank Harber of Kitchener.

Lower centre, left and right: These two photos include the head table guests, at the Kitchener inaugural dinner. Left to right, they are W. J. W. Reid, Hamilton, Ontario, vice-president; Mrs. J. A. Vance; A. W. Whitaker, Jr., Montreal, treasurer; Mrs. M. A. Montgomery; President Armstrong; M. A. Montgomery, chairman of the new branch; past-president L. F. Grant, Kingston; Alderman Frank Harber; Mrs. Armstrong; J. A. Vance, Woodstock, Ontario vice-president; Mrs. A. W. Whitaker, Jr.; Neil Metcalf, Hamilton Branch chairman; Mrs. W. J. W. Reid; and the general secretary.

Bottom: Principals in the Kitchener inaugural ceremonies.

Presidential Journey

The second leg of the president's tour of the branches started at Montreal on October 13th and finished at the same place November 9th. It took in all the branches between Victoria and Sault Ste. Marie, plus Hamilton and Kitchener. In 27 days about 6,500 miles were covered and 45 scheduled meetings of one kind or another were attended.

The details of the meetings will be described in the branch news, in addition to which the photographs reproduced in the *Journal* will give much additional information.

Unfortunately the president had to return to Montreal before he could complete the western schedule. The Kootenay Branch at Trail and the branch at Lethbridge had to be skipped but it is the intention to visit them in the Spring.

There are many things to be learned from these presidential tours. Through meetings with the branch executives and with the memberships at large it is possible to keep one's hand on the pulse of the organization—it is possible for the officers of the Institute to gauge the vitality of the society, and in turn their visit provides the contact from branch to branch which helps to expand the national character of the Institute. Tours of this kind are a great "job of work" for the president but they are of inestimable value to the Council of the Institute and to the branches.

Looking back over the recent 27 days there are certain things that come to mind quickly. Every branch extended the warmest hospitality and therefore these comments are not intended to set up any comparisons but rather to review some highlights.

Meetings at every branch were excellent both in spirit and numbers present, and in most cases were larger than on any previous occasion. It seemed to be proved that evening meetings with the ladies present were by far the most successful.

The business meetings with the executive committees were most useful. There were so many items on the agenda and so much interest in the discussions that time was always too short. For example, at Winnipeg the group of 21

The dinner meeting at the Lakehead Branch shattered all previous attendance records. The photo below shows a portion of the gathering.

Left, top and centre are views of the meeting at the Sault Ste. Marie Branch. At the head table (centre photo) were D. S. Holbrook, executive vice-president, Algoma Steel Corp.; President Armstrong, D. C. Holgate, branch chairman; J. A. Vance, vice-president; E. B. Barber, president, Algoma Central Railway.

Lower left: Another view of the Lakehead Branch dinner meeting, showing part of the head table. Left to right, President Armstrong; Branch Chairman H. M. Olsson; Mrs. Armstrong and W. H. Small.

When the president visited the University of Manitoba, he presented the certificate of the student prize for 1948-49 to C. A. Kain. In the picture at top right, are A. H. S. Gillson, president of the University; Mr. Armstrong, Mr. Antenbring, Mr. Kain, past president Fetherstonhaugh, and Dean A. E. MacDonald of the Faculty of Engineering and Architecture.

Right, centre and lower: In Winnipeg the meeting took the form of a luncheon. The picture at right centre shows a portion of the group. The head table (lower, right), included (left to right): T. E. Storey; Past President E. P. Fetherstonhaugh; Mr. Armstrong; Branch Chairman C. V. (Andy) Antenbring; D. M. Stephens, deputy minister of mines and resources for Manitoba; R. Noonan, chairman of the Electrical Section; W. C. Heeney; A. W. Lamont. In the foreground is J. W. Greenlaw.

gathered for dinner at 6.00 o'clock, and at midnight the chairman felt the meeting should be adjourned —not because the business was finished but because it was midnight. The interest of the branch officers everywhere was most encouraging to the visitors.

The meetings with the students were outstanding. At each of the four universities, lectures were called off so that everyone could attend. At the University of British Columbia over 800 were present and at each of the others the attendance was limited only by the capacity of the auditorium.

The largest group at a branch meeting was at Edmonton where 470 attended. The banquet was followed by a ball, which plan seems to offer something for other branches to consider. Here a new Engineers' Wives Association has just been formed, and it is more than probable that this organization had a lot to do with the success of the meeting.

A special acknowledgement of the Wives Association was made by the branch secretary treasurer, Keith Cumming who proposed a toast to the ladies and their association—and did it well. The vice-president of the Association Mrs. R. M. Hardy replied. By way of a salute to the new organization and as an encouragement to other branches the *Journal* is printing herewith Mrs. Hardy's response.

On behalf of the members of the Engineers' Wives Association, and with their permission, on behalf of our honoured lady guests, I wish to thank Mr. Cumming for his most delightful expression of good wishes, analytical comments, and charming compliments.

We bow to the greater discern-

Top: The president was speaker at a Kiwanis luncheon at Prince Albert, Sask.

The photo at centre was taken at Saskatoon, and the lower one at Winnipeg. They are typical of the large numbers of students who turned out to hear the president at the western universities.

ing ability of the male sex, and gratefully accept every word that has just been said about us.

Indeed, had it not been for the strong inspiration given us by the men's organization, who called upon us to unite, we might still be only a powerless number of individual women, unable to help or hinder.

But now we are in a position to be of great assistance to the men, particularly in such matters as designing, dirt-digging, refining of crude, electrifying, and the generating of power,—and in mining problems we shall be invaluable with our blasting.

Turning back to the gracious toast just proposed, I am sorry that the gentlemen were forced to

Top: At the University of Alberta, shown here are (left to right): H. L. Morrison; President Armstrong; Dean R. M. Hardy; and Al Norem, representative of the engineering student body.

Upper centre: The presidential party met with members of the Central British Columbia Branch at the Central Hotel in Kamloops.

Lower, centre: The visit to the Royal Canadian School of Military Engineering culminated in the president's laying of a wreath on the cenotaph. From left to right, the group includes: Mrs. G. W. Allan; Mrs. Armstrong; H. Nolan MacPherson, and W. N. Kelly, Vancouver; Maj.-Gen. G. R. Turner, Ottawa; Major D. H. Rochester, officer commanding the school; the president; Mrs. Barry; G. W. Allan, Vancouver branch chairman; Mrs. Kelly; Past-President J. N. Finlayson; and the general secretary.

Below: An unprecedented attendance of some 470 branch members, guests and their ladies was recorded at the annual banquet and ball of the Edmonton Branch, which had been arranged to coincide with the presidential visit.

drink a dry, water toast to honour and greet us. Our new association should really have been launched with champagne.

However in spite of this dry toast, we are determined to become more than just dry toast—we shall be crisp, well-buttered, hot toast.

I would like to be able to return some of the kindness expressed in Mr. Cumming's toast. But ladies have never been known to propose a toast to the gentlemen. Even were it possible to disregard this significant rule of etiquette, the obstacle facing us would still be insurmountable. For in trying to choose a toast appropriate to gentlemen, I would find myself confused by the long list of different varieties of toast.

For example, I would hesitate to serve any burnt toast, for fear some of our gay flames might misconstrue it and refuse to glow again.

Similarly, to serve a soggy toast might possibly offend those who have a dry sense of humour.

And then again, how could I offer milk toast known in the vernacular as graveyard stew, the food of invalids and dissipators?

And only to those men who habitually affect yellow ties would we be likely to offer Melba toast.

Therefore it would seem to me that the only possible kind of toast suitable to serve to the gentlemen would be French toast, the toast "par excellence".

This toast is both soggy and crisp, inside, soft and mushy as milk toast, outside hot and hard, and crusty like dry toast, satisfying to the soul like well-buttered toast. It is the perfect combination of qualities required and desired by lady toast-consumers. In short, it is both horrible and delightful.

But ladies, after finding the ideal toast for the gentlemen, I do not feel that we can do it justice with cold, dry water.

Let us remain seated.

At Saskatoon the visitors had their busiest days. In addition to the usual meeting with the executive and with the branch, it had been arranged for them to meet with the faculty, and with the executive of the Engineering Society, and with the editorial board of the *Saskatchewan Engineer*. On top of this there was a very pleasant visit with the president of the University, Dr. James S. Thomson. These additional business meetings added a great deal to the pleasure of the

The top photo was taken at the meeting in Calgary.

Centre: The dinner group at the Empress Hotel in Victoria, B.C.

Bottom: This picture was made during the dinner of the Vancouver Branch at the Stanley Park Pavilion. G. A. Gaherty (second from right) was a visitor from Montreal.

The Vancouver Branch meeting was held at the Pavilion at Stanley Park.

Norman Marr, Ottawa (left foreground), and Col. L. J. Rumaggi, U.S. Corps of Engineers (second from right), were guests at the meeting at Sault Ste. Marie.

visitors, and it was their hope that in return they may have contributed something to the affairs of the university.

At Vancouver the visit to the Royal Canadian School of Military Engineers at Chilliwack was an outstanding feature of the programme. Major Rochester the officer in charge was an excellent host and guide, and through him the visitors obtained a closeup view of the splendid work being done. At the conclusion of the visit, the president placed a wreath on the cenotaph.

The tour included two well-attended regional meetings of Council, 27 were present at Kitchener and 33 at Vancouver.

At Winnipeg the party inspected the new engineering building of the University of Manitoba. It is a beautiful structure both inside and out, and is a great addition to the educational facilities of Canada. As seems standard practice at all Canadian universities, there is absolutely no resemblance between the outside architecture of this building and any other on the campus. Perhaps this just emphasizes how much better the new structure is than are the older ones.

Another very pleasant feature of the visit to the University of Manitoba was the luncheon at which the visitors and the executive of the branch were guests of the president of the university, Dr. A. H. S. Gillson, at the Faculty Club.

Not everyone realizes that the Winnipeg branch has a technical section—the only one in all the branches. It is an electrical section and has been functioning for several years. There are 110 names on the mailing list. and meetings are attended by from 40 to 80 people. Here is an idea for other branches. Why not provide within the branch, technical outlets for all groups who wish to develop their own specialty?

At Calgary it was discovered that the branch not only holds technical meetings frequently but that they meet for lunch every Monday. These meetings are always at the same restaurant and a member can drop in any Monday and be sure to find congenial company. There are short talks of 10 to 15 minutes duration. Each week from 20 to 30 members turn out.

The Engineers' Wives Association just formed at Edmonton is the fourth group to follow that pattern. The others are Ottawa, Winnipeg, and Calgary.

Out of the whole trip the president and general secretary gained the firm opinion that the affairs of the Institute are in splendid condition. Everywhere there are increased activities. There is an atmosphere of enthusiasm, and an urge to go on to even greater things. It is the general opinion that the Institute is facing new opportunities and new duties, and there is the general feeling that everyone is ready to help in meeting these conditions.

News of Other Societies

The **Canadian Electrical Association** (Room 704, Tramways Bldg., Montreal, Que.) has scheduled 1950 meetings as follows: the annual winter conference at Quebec City, January 16, 17, 18; the annual convention at Murray Bay, Que., June 15-19.

The 1950 annual meeting of the **Canadian Construction Association** will take place in Montreal, at the Mount Royal Hotel, January 15-18.

The **Canadian Section** of the **American Water Works Association** plans the next convention to take place at Niagara Falls, Ont., at the General Brock Hotel.

The **Chemical Institute of Canada** (18 Rideau Street, Ottawa) announces that the 33rd annual Canadian Chemical Conference of the Institute will be held at the Royal Hotel, Toronto, Ont., June 19-22, 1950.

The annual meeting and annual luncheon of the **Association of Professional Engineers of Ontario** (350 Bay Street, Toronto, Ontario) will take place at the Royal York Hotel in Toronto, on January 28, 1950.

The **American Society of Civil Engineers** (33 West 29th Street, New York 18, N.Y.) plans the 1950 annual meeting to take place in New York City, January 18-20. The spring meeting will be in Los Angeles, April 19-21.

Hotel William Penn, Pittsburgh, Pa., has scheduled February 27-March 3, 1950, for the committee week and spring meeting of the **American Society for Testing Materials** (1916 Race St., Philadelphia, Pa.)

The 18th annual meeting of the **Institute of Aeronautical Sciences** (2 East 64th Street, New York 21, N.Y.) is scheduled for January 23-26 at the Hotel Astor, New York, N.Y.

The 1950 annual meeting of the **American Institute of Mining and Metallurgical Engineers** (29 West 39th Street, New York 18) will be at the Statler (Pennsylvania) Hotel, New York City, February 12-16.

A Plant Maintenance Show and Conference will be held at the Auditorium Cleveland, Ohio, January 16-19, under the sponsorship of the **American Society of Mechanical Engineers** and of the **Society for Advancement of Management.**

Information can be obtained from the exposition management, Clapp and Poliak, Inc., 34 Madison Avenue, New York 17, N.Y.

Prairie Water Problems

The Prairie Water Problems Committee, under the chairmanship of Mr. G. A. Gaherty, met on September 22 in Lethbridge, Alta., with the following members present: P. M. Sauder, G. L. McKenzie, D. W. Hays, B. Russell, G. N. Houston, C. S. Clendening, T. D. Stanley, (secretary). In addition there were present by invitation: G. S. Brown, W. A. Foss, D. A. Hansen.

The committee confirmed the appointment of Mr. Sauder to work with the irrigation committee of the American Society of Civil Engineers in planning the programme for the joint meeting of that Society with the Institute's annual meeting for 1950.

In the matter of international waters, the committee approved of the representations being made by the Institute to secure the appointment of an engineer to the International Joint Commission. It was also noted that a watchful eye should be kept on the division of the waters of the Waterton and Belly Rivers in the border areas of Alberta and the United States.

There was also a discussion of the apparent conflict between the 3 prairie provinces with respect to the Saskatchewan River Drainage Basin — which conflict had been indicated in the papers presented at the 1948 Annual Meeting in Banff. This led to further discussion on the establishment and functions of the Prairie Provinces Water Board and the general feeling was that no action is warranted at present but that a watching brief should be maintained to ensure that the committee would be prepared to take a more active part if necessary.

1949 Hoover Medal Award

It has been announced that Dr. Frank B. Jewett*, of Short Hills, N.J., former president of the National Academy of Sciences, and an outstanding figure in the scientific and engineering world, will be awarded the Hoover Medal for 1949, one of the highest honours of the engineering profession.

Dr. Jewett was for many years president of the Bell Telephone Laboratories and vice-president of American Telephone and Telegraph Corporation.

* As this *Journal* goes to press word has been received of the death of Dr. Jewett.

The medal is awarded by the American Society of Chemical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, and the American Institute of Electrical Engineers, and will be conferred on Dr. Jewett at the Winter General Meeting of the latter society, January 30-February 3, 1950, in New York.

The medal, first awarded to Herbert Hoover in 1930 and named for him, is given " by engineers to a fellow engineer for distinguished public service."

REGISTRATION IN ENGINEERING AT CANADIAN UNIVERSITIES

University	Year	General Course	Aeronautical Engineering	Agricultural Engineering	Ceramic and Non-metallic Minerals	Chemical Engineering	Civil Engineering	Electrical Engineering	Engineering and Business Administration	Electro-Mechanics	Forest Engineering	Geology and Mineralogy Engineering	Mechanical Engineering	Metallurgical Engineering	Mining Engineering	Engineering Physics	Total
Dalhousie University.	1st	30															30
	2nd	34 (5)															34 (5)
	3rd	59 (24)															59 (24)
Total.......	....	123 (29)															123 (29)
Saint Mary's College, Halifax.	1st	23															23
	2nd	14															14
	3rd	13															13
Total.......	....	50															50
St. Francis Xavier.	1st	65 (4)															65 (4)
	2nd	73 (7)															73 (7)
	3rd	67 (11)															67 (11)
Total.......	....	205 (22)															205 (22)
N.S. Tech. College.	3rd					16 (8)	86 (44)	54 (29)					76 (35)	2 (1)	9 (6)		243 (123)
	4th					15 (7)	49 (23)	35 (20)					64 (34)		12 (8)		175 (92)
Total.......	....					31 (15)	135 (67)	89 (49)					140 (69)	2 (1)	21 (14)		418 (215)
Acadia University.	1st	33															33
	2nd	25 (3)															25 (3)
	3rd	25 (12)															25 (12)
Total.......	....	83 (15)															83 (15)
Mount Allison University.	1st	33 (2)															33 (2)
	2nd	37 (5)															37 (5)
	3rd	36 (15)															36 (15)
Total.......	....	106 (22)															106 (22)
University of New Brunswick.	1st						24	18									42
	2nd						36 (4)	18 (1)									54 (5)
	3rd						41 (12)	35 (20)									76 (32)
	4th						89 (71)	81 (68)									170 (139)
Total.......	....						190 (87)	152 (89)									342 (176)
Laval University, Quebec.	1st	101															101
	2nd					11	29 (1)	14 (1)				3 (1)	3 (1)	1	4		65 (4)
	3rd					15 (3)		22 (4)				7 (2)		3	5		52 (9)
	4th					10 (2)		25 (3)				1		1	10 (1)		47 (6)
Total.......	....	101				36 (5)	29 (1)	61 (8)				11 (3)	3 (1)	5	19 (1)		265 (19)
Ecole Polytechnique	1st	113 (1)															113 (1)
	2nd	87 (4)															87 (4)
	3rd	82 (6)															82 (6)
	4th					3 (1)	51 (6)			34(6)					10		98 (13)
	5th					5	47 (1)			21(3)					6		79 (4)
Total.......	....	282 (11)				8 (1)	98 (7)			55(9)					16		459 (28
McGill	1st	202 (19)															202 (19)
	2nd					25 (3)	49 (16)	31 (12)					55 (12)	7 (2)	13 (5)	8 (2)	188 (52)
	3rd					70 (43)	87 (46)	85 (55)					117 (70)	23 (15)	18 (9)	12 (2)	412 (240)
	4th					64 (41)	85 (57)	125 (102)					142 (112)	13 (7)	21 (20)	11 (8)	461 (347)
Total.......	....	202 (19)				159 (87)	221 (119)	241 (169)					314 (194)	43 (24)	52 (34)	31 (12)	1263 (658
Ottawa University.	1st	1				5	4	4				1	6		2	1	24
	2nd						4	2					6 (1)				12 (1
Total.......	....	1				5	8	6				1	12 (1)		2	1	36 (1
Carleton College.	1st	31 (1)															31 (1
	2nd	29 (6)															29 (6)
Total.......	....	60 (7)															60 (7
Queen's University.	1st	185 (13)															185 (13)
	2nd	211 (47)															211 (47)
	3rd					34 (9)	61 (24)	53 (35)				14 (6)	59 (29)	17 (11)	9 (8)	16 (4)	263 (126)
	4th					48 (29)	44 (37)	58 (46)				12 (10)	51 (43)	17 (16)	16 (13)	15 (7)	261 (201
Total.......	....	396 (60)				82 (38)	105 (61)	111 (81)				26 (16)	110 (72)	34 (27)	25 (21)	31 (11)	920 (387)
Toronto.......	1st		11 (2)		5 (1)	94 (2)	67 (4)	81 (12)	51 (4)			17	71 (10)	5 (1)	8 (1)	29 (2)	439 (39
	2nd		10 (3)		5 (1)	83 (18)	111 (45)	83 (29)	56 (21)			11 (2)	116 (52)	21 (8)	14 (3)	39 (6)	549 (188
	3rd		36 (24)		10 (5)	109 (60)	139 (87)	158 (119)	73 (39)			23 (12)	205 (149)	18 (16)	22 (16)	43 (22)	836 (549)
	4th		54 (42)		8 (4)	157 (99)	152 (105)	193 (166)	84 (60)			30 (23)	249 (194)	38 (29)	32 (23)	71 (49)	1068 (794)
Total.......	....		111 (71)		28(11)	443(179)	469 (241)	515 (326)	264(124)			81 (37)	641 (405)	82 (54)	76 (43)	182 (79)	2892(1570)
Manitoba.......	1st	139 (5)															139 (15)
	2nd	109 (28)															109 (28)
	3rd						41 (20)	47 (31)					57 (34)				145 (85)
	4th						76 (49)	109 (84)					77 (50)				262 (183)
Total.......	....	248 (43)					117 (69)	156 (115)					134 (84)				655 (311

Note—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.

REGISTRATION IN ENGINEERING AT CANADIAN UNIVERSITIES — Continued

University	Year	General Course	Aeronautical Engineering	Agricultural Engineering	Ceramic and Non-metallic Minerals	Chemical Engineering†	Civil Engineering	Electrical Engineering	Engineering and Business Administration	Electro-Mechanics	Forest Engineering	Geology and Mineralogy Engineering	Mechanical Engineering	Metallurgical Engineering	Mining Engineering	Engineering Physics	Total
Saskatchewan	1st	169 (5)	......	....	....	....	....	....	......	...	.....	......	....	......	......	......	169 (5)
	2nd	112 (15)	......	....	....	7	....	....	......	...	.....	......	....	......	......	8	127 (15)
	3rd	....	......	3 (2)	4 (2)	15 (2)	30 (8)	12 (1)	......	...	.....	5	34 (7)	......	......	12 (3)	115 (25)
	4th	....	......	28 (15)	7 (3)	23 (10)	53 (37)	53 (38)	......	...	.....	12 (6)	79 (52)	......	......	17 (9)	272 (170)
Total.......	....	281 (20)	......	31 (17)	11 (5)	45 (12)	83 (45)	65 (39)	......	...	.....	17 (6)	113 (59)	......	......	37 (12)	683 (215)
Alberta	1st	163 (11)	......	....	....	....	....	....	......	...	.....	......	....	......	......	......	163 (11)
	2nd	....	......	....	....	49 (8)	50 (17)	27 (2)	......	...	.....	......	....	......	6 (3)	......	132 (30)
	3rd	....	......	....	....	69 (37)	46 (24)	48 (35)	......	...	.....	4	....	......	18 (13)	1	186 (109)
	4th	....	......	....	....	78 (59)	89 (68)	78 (61)	......	...	.....	......	....	......	33 (27)	10 (5)	288 (220)
Total.......	....	163 (11)	......	....	....	196 (104)	185 (109)	153 (98)	......	...	.....	4	....	......	57 (43)	11 (5)	769 (370)
British Columbia.	1st	227 (18)	......	....	....	....	....	....	......	...	15	......	....	......	......	......	242 (18)
	2nd	249 (60)	......	....	....	....	....	....	......	...	10 (3)	......	....	......	......	......	259 (63)
	3rd	....	......	8 (3)	....	44 (23)	86 (28)	67 (34)	......	..	23 (16)	17 (12)	93 (47)	14 (7)	16 (9)	9 (5)	377 (184)
	4th	....	......	11 (7)	....	66 (38)	85 (50)	103 (78)	......	...	21 (20)	31 (21)	132 (86)	23 (13)	27 (17)	9 (3)	508 (333)
Total.......	....	476 (78)	......	19 (10)	....	110 (61)	171 (78)	170 (112)	......	...	69 (39)	48 (33)	225 (133)	37 (20)	43 (26)	18 (8)	1386 (598)
Grand Total	....	2777 (337)	111 (71)	50 (27)	39 (16)	1115 (502)	1811 (884)	1719 (1086)	264 (124)	55 (9)	69 (39)	188 (95)	1692 (1018)	203 (126)	311 (182)	311 (127)	10715 (4643)
Prospective 1950 Graduates	....	....	54 (42)	39 (22)	15 (7)	466 (285)	769 (498)	860 (666)	84 (60	21 (3)	21 (20)	86 (60)	794 (571)	92 (65)	157 (109)	133 (81)	3591 (2489)

†Alberta includes Petroleum Engineering, 2nd Year 26 (6), 3rd Year 29 (19), 4th Year 16 (12).

NOTE—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.

Once again the *Journal* presents its annual tabulation of registration in the engineering courses offered by Canadian universities and colleges.

As would be expected, the table this year shows a further reduction in enrolment of new students into first year classes. This is due entirely to the decrease in those entering on V.L.A. benefits — in fact non-veteran enrolment is somewhat higher than the figures reported last year. It is noteworthy that for the first time some of the schools report no veteran enrolment in first year.

The popularity of the various courses remains in substantially the same ratios as for previous years although registration in combined engineering and business courses and in the electro-mechanics course at Ecole Polytechnique is up slightly while all other courses are down.

Since it has been said that the veterans have been particularly serious in their studies, tendency to greater reduction in numbers in succeeding years of each course might have been expected as the proportion of veterans decreased. No such tendency is evident in this year's figures however.

Starting Salaries for Graduates

The Placement Bureau of McGill University has issued figures on starting salaries for 1949 graduates in engineering and commerce.

Type of Employment	No. of Grads Reporting	Average Monthly Salary
1. *Engineering*		
(a) Training courses	16	$219.00
(b) Graduate work	18	
(c) Government service ..	23	$212.00
(d) Sales	16	$240.00
(e) General engineering ..	195	$234.00
2. *Commerce*		
(a) Business, industry, government service, etc.	114	$201.00
(b) Accounting firms	47	$127.00
(c) Graduate work	17	

These figures give average starting salaries of $226.00 for engineers and $201.00 for those commerce graduates who enter equivalent jobs rather than the apprenticeship plans of the chartered accountant firms.

The Bureau has pointed out that these figures are compiled from incomplete returns. Two hundred and fifty of 319 engineers and 161 of 250 commerce graduates reported salaries.

Sixty-fourth Annual General Meeting

Notice is hereby given, in accordance with the by-laws, that the Annual General Meeting of The Engineering Institute of Canada for 1950 will be convened at Headquarters at eight o'clock p.m. on Thursday, January 12th, 1950, for the transaction of necessary formal business, including the appointment of scrutineers for the officers' ballot. It will then be adjourned to reconvene at the Royal York Hotel, Toronto, on Wednesday, July 12th, 1950.

Personals

Notes of the Personal Activities of Members of the Institute

Alexander Scott, M.E.I.C., has retired from the position of division engineer of Canadian National Railways, Halifax, N.S.

Mr. Scott, whose engineering career dates back more than fifty years, graduated in science from Herriott Watt College and studied engineering with Edward Sang and Sons Limited at Edinburgh Scotland. He was assistant city engineer of Kirkcaldy for nearly ten years, before coming to Canada in 1911, and entering the railway service. He worked at Montreal, North Bay, and Sydney, before being promoted to assistant engineer at Charlottetown, P.E.I. in 1915. He was appointed C.N.R. division engineer at Halifax, N.S. in 1927.

Mr. Scott directed the conversion of the Prince Edward Island Railway from narrow to standard gauge. He supervised other well known railway projects, also. One of the most important projects in which he had a hand was the construction of the 65,000-sq. ft. lighterage dock and facilities at Halifax in World War II which were built to facilitate the handling of the tremendous war traffic moving from the United States and Canada to Europe.

Angus S. Gunn, M.E.I.C., principal assistant engineer of the Atlantic Region of the Canadian National Railways, retired in October 1949, after 42 years in railway work.

In World War II, in addition to his railway duties, Mr. Gunn acted for the Department of National Defence and played an important part in establishing military bases, airports and radio stations in the Maritimes. He was also assistant commandant for the area for civil defence. For gallantry in the World War I, he was awarded the Military Cross while serving as a lieutenant with the Canadian Artillery.

Graduating from Dalhousie University, Halifax, Mr. Gunn joined the National Transcontinental Railway in 1907 as a rodman. He served at various locations in the Maritimes as resident engineer. In 1912 he was engineer for the contracting firm of James H. Corbett on the construction of the N.T.R. terminal yard and facilities at Moncton, N.B. He entered Canadian National Railways as a transitman at Moncton in 1913 and held progressively the posts of resident engineer, assistant engineer, construction engineer and right-of-way engineer. He was appointed principal assistant engineer in 1943.

Mr. Gunn is a past president of the Association of Professional Engineers of New Brunswick; a past councillor of the Engineering Institute of Canada; a past president of the Canadian Legion and is presently a member of the executive of that organization.

A. E. K. Bunnell, M.E.I.C., consultant on community planning with the Ontario Department of Planning and Development, has been named a member of the board of directors of the American Society of Planning Officials. His election recognized his outstanding service, since its inception, with the Ontario Department, the first planning ministry established in Canada.

D. E. Blair, M.E.I.C., has retired from the Montreal Tramways Company, after 46 years of active service with the Company. He will continue to act as consulting engineer.

He has been vice-president and general manager of the Company since 1942. He joined its staff in 1903 as assistant general superintendent. He was appointed general superintendent in 1925, and general manager in 1938.

Arthur Duperron, M.E.I.C., has been appointed general manager of Montreal Tramways Company, succeeding D. E. Blair.

Mr. Duperron graduated in 1911 from Ecole Polytechnique. He was engaged in hydro-electric surveys in Quebec in 1911 and 1912, after which he served with the Canadian Pacific Railway until 1915. From 1915 to 1927 he was associated with the Quebec Streams Commission and was named assistant chief engineer in 1925. Two years later he was appointed chief engineer of the Montreal Tramways Commission, and in 1937, chief engineer of the Montreal Tramways Company. In 1942 he was appointed assistant general manager of the Company.

W. H. Paterson, M.E.I.C., recently appointed chief engineer of the Toronto Transportation Commission, has been with the Commission since 1942, when he started as assistant engineer. The next year he was made office engineer of the Rapid Transit Department of the Commission and in 1946 was promoted to the position of engineer of rapid transit. Last year he became executive assistant to the assistant general manager, and in May of this year he was appointed as the Commission's chief engineer.

Mr. Paterson graduated from Queen's University, Kingston, Ont. in 1934 with a degree of B.Sc. in civil engineering.

From that year until 1942 he served successively with McArthur Construction Co., as foreman at Clinton, Ont.; with the city of Owen Sound, Ont., as assistant city engineer; with McArthur Construction Co. as resident engineer at Allison, Ont.; with General Supply Co., of Canada Ltd., Toronto, as sales engineer; and with the Tropical Oil Co., Barranca, Bermeja, Colombia, in South America.

Dr. B. Szczeniowski, M.E.I.C., professor at the Ecole Polytecnique (University of Montreal), has been awarded the First Prize ex-aequo for 1949 in the Literary and Scientific Contests of the Province of Quebec, in Section of Applied Sciences.

Angus S. Gunn, M.E.I.C.

D. E. Blair, M E.I.C.

Arthur Duperron, M.E.I.C.

for his work on the theory of ram-jet propulsion, which was published in the November 1948 issue of the *Canadian Journal of Research.* He is engaged now in research on multicelled diffusers as applied to aviation purposes, this work being sponsored by the Defence Research Board and carried out at the Ecole Polytechnique.

J. J. O'Sullivan, M.E.I.C., of Central Mortgage & Housing Corporation, has been transferred by the Corporation to Halifax, N.S., to take charge of the National Defence project at Tuft's Cove, N.S.

He has been in Montreal, a regional construction engineer for the Corporation. He was at Halifax from 1941 to 1944 as chief supervising engineer of Wartime Housing Ltd.

Philip B. French, M.E.I.C., has been appointed general manager of Ahlberg Bearings Canada Limited, Montreal. Prior to his new appointment Mr. French was sales manager of the Company since its inception in 1945.

Mr. French is a graduate of McGill University class of 1934. He was a sales engineer for Canadian SKF Co. Ltd., in Montreal, before joining the Ahlberg Company.

James C. Leahey, M.E.I.C., of Ahlberg Bearings Canada Limited, Montreal has been appointed sales manager of this Company. Prior to this appointment he was sales engineer since the inception of the Company in 1945.

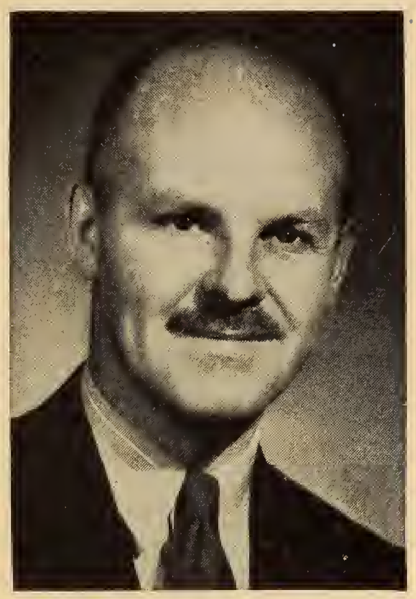
Mr. Leahey is a graduate of McGill University, in the electrical engineering class of 1935.

A. M. Thompson, M.E.I.C.

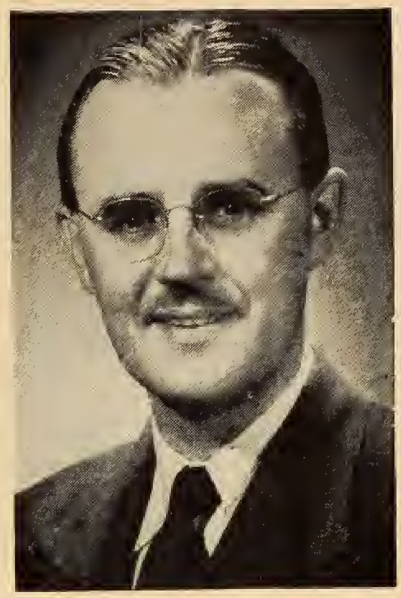
Donald Roy Cameron, M.E.I.C., of Vulcan Iron & Engineering Ltd., has been transferred to Calgary as branch manager. He was previously with the Company at Winnipeg, where he was an estimator. He is a graduate of University of Manitoba of the electrical engineering class of 1934.

P. M. de Chazal, M.E.I.C., has recently been elected director and vice-president of the Stanley Tool Company of Canada Ltd., and has been appointed manager of their plant in Roxton Pond, Quebec.

Mr. de Chazal is a graduate of McGill University, Montreal. He has been with the Stanley Tool Company since 1948. He had previously been for three years in Sao Paulo, Brazil, the chief engineer of the Campanhia Braseiliara de Cimento Portland Perus.



P. B. French, M.E.I.C



James C. Leahey, M.E.I.C.

Major H. D. Berry, M.E.I.C., R.C.E., has been posted to the Engineer Research and Development Laboratories and The Engineer Centre at Fort Belvoir, Va., U.S.A., as Canadian liaison officer. His tour of duty will be two to three years.

He was previously stationed at Vancouver, B.C., where he was B.C. area engineer for the Department of National Defence (Army).

Geo. A. McCubbin, M.E.I.C., **Ernest C. Brisco, Jr.,** and **Herbert H. Todgham,** JR.E.I.C., have formed the firm McCubbin, Brisco & Todgham, surveyors and civil engineers, Chatham, Ont.

Mr. McCubbin has been practising at Chatham for many years. The new firm will be handling a civil engineering practice covering drainage, structural design and land survey.

Mr. Todgham, who graduated from University of Toronto in 1946, was formerly with C. G. R. Armstrong, consulting engineer at Chatham.

A. M. Thompson, M.E.I.C., of Canadian General Electric Co. Ltd., has been appointed central station engineer in the Apparatus Division of the Company at Montreal. Mr. Thompson was apparatus sales engineer at Winnipeg prior to his new appointment.

He received his B.Sc. in electrical engineering from the University of Alberta and later took C.G.E.'s "Test" training at Peterborough. He was chairman in 1949 of the Electrical Section of the Winnipeg Branch of the Engineering Institute.

Lt.-Col. W. R. Scrimes, M.E.I.C., who is assistant distribution engineer of the Winnipeg Electric Co., and commanding officer of reserve signal regiment won second place in a Canada-wide competitive exam for signals officers. Mr. Scrimes graduated from the University of Manitoba with a degree of B.Sc. in electrical engineering in 1940.

F. M. Barchard, M.E.I.C., has been appointed the representative in British Columbia, Alberta and Saskatchewan, for the Canadian Meter Company Limited, of Hamilton, Ontario.

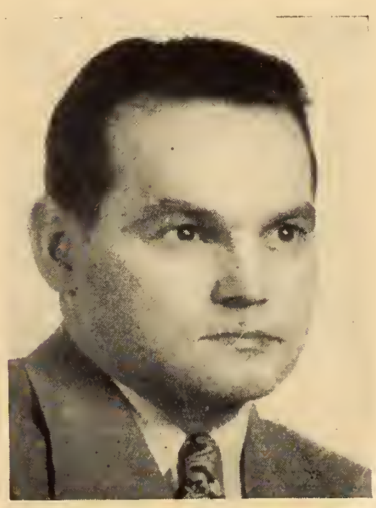
Mr. Barchard recently organized the Barchard Engineering and Equipment Company in Edmonton, Alta., after spending several years in the engineering field. He was formerly chief engineer for the Northwest Industries Ltd., also mechanical engineer of the Diesel Engineering Union Tractor and Equipment Company Limited of Edmonton Alta.

Mr. Barchard graduated from the University of British Columbia in 1941 with a degree of B.A.Sc. in mechanical engineering.

ERRATUM

In the November *Journal,* a personal about **W. E. Fenn,** M.E.I.C., contained incorrect information. It should have read as follows:

W. E. Fenn, M.E.I.C., has been temporarily assigned to headquarters of the Department of Transport at Ottawa, as acting executive assistant to the director of air services. He will be returning to his former position as district radio engineer with the Department of Transport at Winnipeg in the summer of 1950.



F. M. Barchard, M.E.I.C.

C. H. Hopper, M.E.I.C., has established a consulting mining engineering practice at Kirkland Lake, Ont.

He was previously with the Shawinigan Engineering Company, working at La Trench, Quebec.

Harry A. Jones, M.E.I.C., who was with the municipal engineering department of Regina Sask., for 23 years, was appointed to the post of city building inspector in October last. Mr. Jones graduated from the University of Saskatchewan in 1927 and worked as a roadway engineer with the city engineering department. Active in military affairs, Mr. Jones was officer commanding the 14 Field Company, R.C.E., at the outbreak of the Second World War and took this unit overseas.

While overseas, he continued in command of his unit and also served as liaison officer with Supreme Headquarters Allied Expeditionary Force. He held the rank of major and returned to Canada in 1946.

F. H. Duffy, M.E.I.C., has been elected chairman of the Junior Section of the Saguenay Branch of the Institute. Mr. Duffy is a system protection engineer of the Aluminum Co. of Canada Ltd., Shipshaw, Ont. He graduated from the University of New Brunswick with a degree of B.Sc. in electrical engineering in 1939.

Maurice Dean, M.E.I.C., has been appointed sales engineer with Starr Manufacturing Works in Dartmouth, N.S. He is a graduate of the N.S. Technical College, class of 1940. He served from 1942 to 1946 with the Royal Canadian Engineers.

B. R. Lewis, Jr.E.I.C., has joined the production engineering department of the Ford Motor Co. of Canada in Windsor, Ont. His work will be concerned with development of electric and hydraulic controls of an automatic nature for production machines. Mr. Lewis was formerly with the Alliance Tool and Motor Company in Toronto where he was a development engineer.

C. H. R. Campling, Jr.E.I.C., is with the Radio and Electrical Engineering Division of the National Research Council, at Ottawa, Ont. Mr. Campling graduated from Queen's University in 1944, and worked for a time as instructor of mathematics there. He was a research assistant at Massachusetts Institute of Technology in 1947 and 1948.

E. A. Moore, S.E.I.C., is a junior engineer with the Ontario Hydro-Electric Power Commission.

He graduated this year from the University of Manitoba with the degree of B.Sc., in electrical engineering.

Donald Lawrence Aker, S.E.I.C., is working for McKinnon Industries Limited, St. Catharines, Ont. Mr. Aker graduated this year from the University of Manitoba in electrical engineering.

A. J. Callaghan, S.E.I.C., is manager in charge of the Cape Breton branch of Maritime Engineering Consultants which was recently inaugurated at Sydney, N.S.

Mr. Callaghan is a graduate of St. Francis Xavier University, and he graduated this year in civil engineering from Nova Scotia Technical College, Halifax.

Robert John Pope, S.E.I.C., is now with the Hydro Electric Power Commission of Ontario. He graduated with a degree of B.Sc. in mechanical engineering from the University of Manitoba in 1949.

John W. Kinahan, S.E.I.C., is now a resident engineer with Proctor, Redfern & Laughlin, Toronto. Mr. Kinahan received his B.Sc. degree in civil engineering this year from the University of Manitoba.

Robert Lloyd Kennedy, S.E.I.C., is now employed by the Northern Crane & Hoist Company of Windsor, Ontario. Mr. Lloyd graduated from the University of Toronto in 1948.

George W. Huggett Jr., S.E.I.C., is now employed with McColl-Frontenac Oil Co. Ltd. He is at the Montreal East refinery, a junior process engineer.

Mr. Huggett is a 1949 graduate in chemical engineering from Queen's University, Kingston, Ont.

VISITORS TO HEADQUARTERS

H. W. Tate, M.E.I.C., Toronto, Ont., October 21, 1949.

Thos. H. Jenkins, M.E.I.C., Detroit, Michigan, October 27.

J. W. Knowles, Institution of Electrical Engineers, Chester, England.

Douglas H. McMurtrie, Gorham, New Hampshire.

S. T. Spencer, Auckland, N.Z., November 23.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

CHARLES EVERETT SISSON

1879 - 1949

Charles Everett Sisson, M.E.I.C., former managing engineer of the Davenport Works of Canadian General Electric Co., Ltd., and recently appointed field secretary of the Institute died suddenly at his home in Stouffville, Ont., on November 25th, 1949.

C. E. Sisson, M.E.I.C.

He was born in Dunham County, Ontario, completed his early education in Peterborough, and entered the employ of Canadian General Electric in 1901. In 1902 he enrolled at the School of Practical Science of the University of Toronto and graduated in 1905 with honours and the class prize. He returned to Canadian General Electric where he specialized in transformer and induction motor design and rose to the position from which he retired at the end of 1947.

Outside of his work, his interests were many. He had been a member of the Peterborough Utilities Commission; chairman of the Toronto section of the American Institute of Electrical Engineers and later vice-president for Canada; councillor of the Association of Professional Engineers of Ontario; chairman of the Toronto Branch, councillor and vice-president of the Institute. He gave generously of his time and energies to educational, Red Cross, church and fraternal work.

Mr. Sisson will be well remembered by a host of friends and particularly by engineers who came to know him through Institute activities. He was appointed field secretary on April 1st of this year and had been looking forward with enthusiasm to the 1949-50 season of activities when he was expecting to visit as many as possible of the branches and make his contribution to the ever-widening scope of Institute operations.

CHARLES ALEXANDER MAGRATH

1860 - 1949

Charles Alexander Magrath, Hon. M.E.I.C., died on October 30, 1949, after a lengthy illness.

Charles Magrath, who was born at North Augusta, Ont., in 1860, was one of the great pioneer builders of the Canadian West. He was a prominent surveyor with commissions to practise in every province; and a successful engineer specializing in irrigation and in water resources investigations. He had made his home in Victoria since his retirement in 1937.

He went West from Ontario in 1878, and in the early days he practised the profession of land surveyor in the Northwest Territories for the Dominion Government.

From 1885 to 1906 he was engaged in general engineering work with the Galt interests in the west, developing irrigation enterprises in Southern Alberta. He retired from the managership of the Alberta Irrigation Company at the end of this period, to serve as a member of the Dominion parliament.

From 1911 to 1914 Mr. Magrath was a member of the International Joint Commission, and was chairman of the Canadian Section from 1914 to 1935. It is probably for his work with the Commission that he was most widely known. He was also well known for his work as chairman of the Hydro-Electric Power Commission of Ontario, from 1925 to 1931.

Mr. Magrath distinguished himself in public life and in the public service of Canada. He entered public life in 1892 when he became a member of the Northwest Territories Legislature, retiring from that office in 1898, when he became a minister without portfolio in the administration of Sir Frederick Haultain. He became mayor of Lethbridge, Alberta, in 1901, and he represented the constituency of Medicine Hat in the Dominion House of Commons from 1908 to 1911. In 1913, he was appointed chairman of a special commission to investigate and report on a highway system in Ontario. The recommendations have been largely carried out in Ontario's great highway programme. In 1919 he became a member of the Advisory Council on Highway Construction in connection with the administration of the Canada Highways Act and financial assistance to the Provinces thereunder. In 1933 Mr. Magrath acted on the Newfoundland Royal Commission to rehabilitate the financial credit of Newfoundland. In 1939 he was appointed by President Roosevelt as the non-national American representative on the Portuguese-American commission for the advancement of peace between the two nations.

Charles Alexander Magrath, M.E.I.C.

During the First World War, Mr. Magrath was a member of the War Trade Board of Canada and of the Patriotic Fund executive. He was also appointed fuel controller in 1917, and was appointed a member of the Advisory Fuel Committee of Canada in 1922. In the year 1920 he was appointed chairman of a special committee to investigate and report upon agricultural conditions in Southern Alberta.

Mr. Magrath joined the Institute as a Member in 1917, and attained Life Membership in 1936. He was elected an Honorary Member in 1938, on which occasion the Institute cited his international reputation as an expert in the conservation and the use of water resources. In 1941 the Institute further recognized Mr. Magrath's work by conferring upon him the Julian C. Smith Medal.

Norman P. Dalziel, M.E.I.C., passed away on October 2, 1949, in Holetown, Devon, England.

Mr. Dalziel was born at Edinburgh, Scotland, in 1878. He graduated from Heriot-Watt College, Edinburgh, and served an apprenticeship with Blyth and Westland, civil engineers of that city. In 1900 he became assistant engineer with this firm on railway and dock work. From 1902 to 1905 he was assistant engineer on maintenance of way for the Natal Government Railways and on preliminary surveys for railways in Zululand. He came to Canada then and from 1905 to 1909 he was assistant engineer of the survey department of Mackenzie and Mann Company of Canada in Toronto. He then became assistant engineer of the construction department of the firm and in 1913 he was appointed assistant comptroller. He went to the staff of the Imperial Ministry of Munitions (Canada) as district inspector. In 1916 he was appointed assistant chief inspector. At the close of the war he was awarded the O.B.E. He remained in Canada for some years after that, and was with Offer, Dalziel and Co. Ltd., with the Canadian Export Paper Co. of Canada, and later with the Canadian Newsprint Company. He returned to England about 1932 where he retired from active work.

Mr. Dalziel joined the Institute in 1906 as an Associate Member transferring to Member in 1918. He attained Life Membership in 1947.

Robert Bell-Irving, M.E.I.C., who was a director and vice-president of the Powell River Company Limited died in Vancouver, B.C., on July 3, 1949. He was in his fifty-fifth year.

Mr. Bell-Irving was widely known in pulp and paper circles of this continent as well as in Australia and New Zealand.

A graduate of McGill University, he joined the Powell River Company in 1920 as assistant resident engineer at Powell River, B.C. Later the same year he was appointed resident engineer. In 1926 he was appointed resident manager, serving in this position until 1932 when he took over the post of assistant general manager of the Company in Vancouver. In 1937 he was appointed a vice-president and in 1944 he was made a director and first vice-president of the Company.

In 1946, due to ill health, he was relieved of the many active and routine duties, and was appointed consultant to the President. In 1948 he asked to be retired from active duty. He remained a director until his death.

During his 29 years' service he played a leading role in the mechanical and technical branches of the newsprint industry and was an authority on paper mill engineering and construction. In the First World War, he served four years with the R.A.F. and R.C.A.F.

He joined the Institute as an Associate Member in 1920, transferring to Member in 1936.

Norman L. Dann, M.E.I.C., who was chief engineer of the wire and cable division of the Northern Electric Company Limited died suddenly at his home in Montreal on October 27, 1949.

Outstanding in his field, Mr. Dann joined the Wire and Cable Company, one of the predecessor companies of Northern Electric, in 1911. His entire career was devoted to engineering work in wire and cable. He was made head of the cable design division of the Company in 1919, and he was chief engineer of the company's wire and cable division from 1933.

Born in Montreal in 1889, Mr. Dann was educated at Mont St. Louis College, Montreal, and studied engineering at the University of Kansas.

He joined the Engineering Institute of Canada in 1927 as an Associate Member, transferring to Member in 1940. He also held membership in the American Institute of Electrical Engineers, and the Telephone Pioneers of America. Up to the time of his death he served on committees of the Canadian Standards Association and the Canadian Electrical Association.

Edwin Harold Hunt, M.E.I.C., who was manager of Texaco Exploration Company, Calgary, Alta., died on July 10, 1949, at Ghost River Dam Lake, Alberta, when the motor boat in which he was riding capsized.

He was born in Fredonia, Kansas, in 1897. He trained in geology at the Universities of Nebraska and Kansas, and did his first field work in the United States for the Empire Gas, and Fuel Co., Bartlesville, Okla., and other American organizations. He was associated with Mr. Irvine E. Stewart, consulting geologist, from 1920 to 1923, when he worked on geological mapping in Montana. He later worked for the Continental Oil Company of Denver, Col.

In 1925 he went to New Zealand for the Taranaki Petroleum Company. He joined the California Petroleum Company in 1927 and later worked for the Texas Company in the United States. He first came to Canada in 1929 to direct the Texas Company's first Alberta plains exploration. He was in the United States again in 1933-1939, as district geologist and division geologist in the Rocky mountain region of that company. In 1934 he was appointed chief geologist in charge of exploration for McColl-Frontenac Oil Company Limited. When the Texas Company joined McColl-Frontenac for joint large scale operations in Alberta, he was made manager of exploration for the two firms. In the last ten years in Alberta, he directed a geological and geophysical programme covering millions of acres. He was named director of the Western Canada Petroleum Association in 1944 and also served a term as Canadian representative for the American Association of Petroleum Geologists.

Mr. Hunt joined the Institute as a Member in 1942.

Derek P. F. Mott, S.E.I.C., who died accidentally in Manitoba in August, 1949, was born in Ottawa in 1924.

He had graduated in 1948 from Queens University in mineralogy and geology, with the degree of B.Sc. He did graduate work at McGill University in Montreal, toward the degree of M.Sc. in geology, and expected to return this fall to complete this work.

At the time of his death, he was doing summer work for the International Nickel Company, at a small lake some distance from Flin Flon, Man.

He had become a student member of the Institute in 1948.

News of the Branches

Activities of the Thirty-one Branches of the Institute and abstracts of papers presented at their meetings

Calgary

T. M. Parry, M.E.I.C.
Secretary-Treasurer

President John E. Armstrong and Dr. L. Austin Wright visited the Calgary Branch of the Institute on October 29, 1949.

At a luncheon meeting the president and general secretary met members of the Calgary executive and discussed matters pertaining to general policy and to Institute affairs. One topic which was discussed at some length was admission, as members, of graduates in honours physics who are employed in engineering positions.

A banquet was held at the Renfrew Club in honour of the president and general secretary. There was an excellent attendance of members and their wives. Following the banquet the audience was entertained by vocal solos and community singing.

The president criticized Canadian federal, provincial and municipal governments for engaging U.S. engineers for their projects. He declared the federal government had removed the tariff on American engineering plans, but had retained the duty on Canadian plans entering the United States.

He wonders why, at a time when U.S. funds are scarce, our governments are spending millions of U.S. dollars to import engineering plans. Our Canadian engineers are equally, if not more, competent than their American confrères. One great difficulty is that American plans specify American equipment. Also American plans are not always adaptable to Canadian climatic conditions and Canadian engineers are often asked to re-design the plans.

The president mentioned that he is not troubled about the ability of Canadian engineering graduates to find employment. The field is expanding so rapidly that unless the economic situation were to approach depression levels, all engineering graduates would find employment.

Hamilton

I. M. MacDonald, Jr.E.I.C.
Secretary-Treasurer

John H. Mitchell, Jr.E.I.C.
Branch News Editor

On Friday, October 14, President J. E. Armstrong, visited the Hamilton Branch of the Institute. The president's party included: J. A. Vance, vice-president; L. Austin Wright, general secretary; and E. J. Blandford, publications manager.

The President, Mr. Vance, and Dr. Wright, together with W. J. W. Reid, vice-president for Ontario, and C. E. Sisson, field secretary, met with the Hamilton branch chairman, Neil Metcalf and the secretary-treasurer, Ian MacDonald, for a special afternoon executive meeting. In the evening the president attended a Smoker in the Officers Mess of the R.C.A., at which approximately 60 members of the branch gathered to hear Mr. Armstrong ask for wider recognition of the engineering profession to keep talent in the Dominion.

The president was introduced by J A. Vance, and thanked by Chairman Metcalf.

Afterward a colour film on " Rail Steel in the World of Today " was presented with compliments of Burlington Steel Company. The film depicts the industry engaged in rail steel recovery and products therefrom.

The president presented prize certificates to three junior members who were successful on the occasion of Junior and Students Papers' Night last spring. Frank Dixon, received first prize; and Leslie Galloway and James Buchanan received the second and third prizes, respectively. Councillors present at the meeting included: F. Walsh, Sarnia; W. A. T. Gilmour, Hamilton; P. Buss, Niagara; A. Malby, Peterborough; and E. A. Cross, Toronto.

Kingston

D. L. Rigsby, M.E.I.C.
Secretary-Treasurer

On Tuesday, October 25, a meeting was held in McLaughlin Hall at Queen's University.

Chairman for the evening was J. W Brooks, and G. T. L. Andrews reported on possible future meetings of the Institute.

L. F. Grant, past president of the Engineering Institute of Canada, introduced the speaker of the evening, W. J. W. Reid, vice-president of the Institute for Ontario.

Mr. Reid's opening remarks consisted of a brief outline of the aims of the Engineering Institute of Canada and of the Association of Professional Engineers of Ontario, of which body Mr. Reid is president. It was stressed that the immediate aims of the two organizations are entirely different but that in each case the engineering profession benefits. The Institute is responsible for furthering the aims of the engineering profession and spreading engineering knowledge, while the Provincial Associations were formed to give protection through law enforcement to the general public who are served by engineers. Complete co-operation between the Association and the Institute will mean success of the profession as a whole.

Mr. Reid had entitled his main talk, **People Are More Than Things.** To illustrate more forcibly his object, he placed himself in the position of a works manager who had just recently been hired to operate an entirely new industry. In the role of manager the speaker outlined all of the main problems that would be confronted in his organization with regard to personnel and operation in general, and the manner in which he proposed to meet those problems. Among the subjects covered were the value of good public relations, the value of the industry in community affairs, the role of foreman in the organization and the importance of good staff assistance, which bodies should be advisers but have no immediate authority to override decisions of foremen.

Considerable time was spent in discussing the relationship between employees and management. It is essential that the employees have a sense of self-esteem and be treated as human beings rather than as mere workers. Security for the future, and the ability to obtain sufficient monetary compensation to allow a reasonable standard of living, are necessary. Management must have the ability to respect, and yet to discipline, the worker. Above all, if industry is to make a profit, a profit must be made on the services of all of the employees even that of the manager. If a profit is not made on this basis the industry as a whole will fail.

After considerable discussion in which the audience acted as shareholders in the make-believe Company, Mr. Reid was thanked by Professor J. S. Campbell of Queen's University. Following a short talk by Professor H. G. Conn regarding the layout of McLaughlin Hall, the group, touring the building, was given an insight into all of the equipment and facilities in this modern mechanical engineering hall of learning. Final year students in mechanical engineering acted as guides for the occasion.

Lethbridge

David Cramer, Jr.E.I.C.
Secretary-Treasurer

J. T. Dokken, S.E.I.C.
Branch News Editor

Sixty members and guests of the Lethbridge Branch were present at a dinner meeting in the Marquis Hotel, Saturday evening, November 20th, to hear Philip Godsell, well known Canadian author, give an address entitled **Arctic Trails.**

The meeting was a Ladies Night, with the wives and friends of the members attending as guests. Chairman R. D. Livingstone presided.

Dr. Liebe capably introduced the speaker, commenting on his many years in Canada's northland when he became acquainted with the languages and customs of the Indians and Eskimos.

Mr. Godsell, an oldtimer of both the north and south, and a fellow of the Royal Geographical Society has written five very interesting books about the Canadian north. He outlined his impressions gained through forty years of living in the midst of the Canadian wilds. Upon arriving in the Hudson Bay area in 1906, Mr. Godsell found an area equal in size to one-half of the United States still under control of the Hudson Bay Company, although their charter had expired some thirty-five years before. Money was completely unknown and trading was carried out by direct barter or by using skins as a medium of exchange. However, as these methods became ponderous a system using tokens for exchange was begun. Mr Godsell told interesting stories of relations between traders and the natives He also mentioned the "Blonde Eskimo" tribe, discovered only in 1926, describing their way of life. He also told of the activities of the North West Mounted Police in the North, and the use made of radio and the aeroplane in their work

J. Brady moved a vote of thanks to Mr. Godsell for a very interesting and educational talk.

Moncton

V. C. Blackett, M.E.I.C.
Secretary-Treasurer

On Monday, September 26, the Moncton branch extended a welcome to President J. E. Armstrong on the occasion of his official visit to the branch. Accompanying the president were Mrs Armstrong, Dr. and Mrs. L. Austin Wright, Mr. and Mrs. I. R. Tait, Mr. and Mrs. R. C. Flitton, Mr. and Mrs Ira P. Macnab, Mr. James Vance and Mr. Barford.

During the afternoon the presidential party, and members of the branch executive and their wives, were taken on a motor tour and shown two of nature's interesting attractions, the Magnetic Hill and The Rocks. Later, the visitors were entertained at tea at The Hills, Hillsboro.

In the evening, a dinner attended by seventy-one members and guests, was held in the Moncton Curling Club. Branch Chairman R. L. Parsons presided and, at his request, Vice-President Macnab introduced the president to the meeting.

In the course of his address Mr. Armstrong stressed the value of close co-operation between the thirty-one branches and the 12,000 members of the Institute. He referred to the importance of social adaptability of members of the organization and the need for members to consider firstly what is best for Canada rather than what they can get out of it. He also spoke of the unjustifiable belief that it is necessary to go outside of Canada to obtain an able engineer for jobs in Canada.

Dr. Wright, the next speaker, told of the Institute's petitioning the federal government to appoint an engineer to the vacancy in this country's representation on the International Joint Commission. He pointed out that while the United States has, of its three members, two competent engineers, Canada's appointments have been political.

During the meeting Mayor Storey spoke briefly, welcoming the visiting engineers. He recalled that three years ago during a water shortage the executive of the Moncton Branch of the Institute had been called upon to aid in seeking a solution.

T. H. Dickson of Moncton spoke briefly, as did V. Ainsworth, Charlottetown.

A vote of thanks to Mr. Armstrong and Dr. Wright was moved by past-president Dr. H. W. McKiel, vice-president of Mount Allison University.

At the close of the meeting a machinist's hammer, suitably engraved, was presented by the chairman to the president, as a memento of his visit.

Montreal

Establishment of new branches of the Institute in the province of Quebec was forecast at a dinner meeting of the branch on September 29th to inaugurate the season's activities. The occasion was the official visit to the Branch of President J. E. Armstrong.

The president who had just returned from a tour of the branches in the Maritimes, including one which he had inaugurated at St. John's, Nfld., was accompanied by J. A. Vance, vice-president for Ontario. In opening the meeting, which was attended by some 200 members, Branch Chairman I. R. Tait reviewed the work done by the executive in the previous months and forecast a small surplus in the year's financial operations.

Mr. Armstrong spoke of his Maritime trip and later developed the theme of professional consciousness.

General Secretary L. Austin Wright reported on headquarters activities, saying that the membership of the Institute now was approximately 12,000.

The meeting saw the presentation of Institute prizes to two students: Claude Howard of McGill and Guy Lamothe of Ecole Polytechnique.

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The committee of the branch, in charge of entertainment, is planning the next social evening which has been scheduled to take place on February 17, at the Mount Royal Hotel.

Peterborough

M. M. Uloth, M.E.I.C.
Secretary-Treasurer

J. C. Allan, M.E.I.C.
Branch News Editor

On October 20, the first lecture of the season was delivered to the Peterborough Branch by Messrs. F. T. Simpson, and A. E. Wilson of Canadian Brazilian Services Ltd. The subject chosen was **Hydro-Electric Development in Brazil.**

Many interesting side lights and economic aspects of the operation of Brazilian Traction, Light & Power Co. were presented.

The generating capacity of the Company's plants is 1,100,000 hp. or about 65 per cent of the installed capacity in Brazil. Its distribution serves approximately 20,000,000 people. The Company also provides telephone service in the states of Rio de Janeiro, Sao Paulo, and the Federal District of Rio de Janeiro. Gas and tramway service is also supplied in the cities of Rio de Janeiro, Sao Paulo and Santos.

The growth of population and industry in the parts of Brazil concerned was described and related to the development of the public services.

Mr. Simpson dwelt upon the differences between hydro-electric problems in Brazil and Canada. Because of the configuration of the land profiles in the area served by the Brazilian Traction, Light and Power Co. the major rivers though originating near the Atlantic coast in an area of high rainfall, drain toward the centre of the continent and discharge into the sea 2,500 miles away. High head power development is possible close to the coast by bringing water from the rivers which naturally flow away from the coast back to the edge of the plateau. Mr. Simpson described how this has been accomplished. Some of the world's largest pumping installations are involved in the reversal of the natural flow, but considerable power is gained because the elevation through which the water must be pumped is much less than the elevation difference to sea level.

The Serra do Cubatao generating station has an installed capacity of 407,-847 kw. and operates under a 2,358 ft. head. The construction of a 330-kilometre 230,000-volt transmission line between the Rio and Sao Paulo systems was described, and the problem of frequency conversion from 50 to 60 cycles was discussed.

Slides were used extensively to illustrate the lecture and a motion picture further illustrated the company's multifarious activities.

A vote of thanks was moved by Dr G. R. Langley who stressed the common heritage of water power resources existing in both Brazil and Canada.

St. Maurice Valley

J. B. Edwards, M.E.I.C.
Secretary-Treasurer

Shawinigan Falls Junior Section

R. J. MacLean, Jr.E.I.C.
Secretary-Treasurer

T. F. Scott, Jr.E.I.C.
News Editor

On October 11 the Shawinigan Falls Junior Section of the Institute opened its 1949-1950 season with a dinner meeting at the Cascade Inn. The guest speaker was W. J. Whitehead, managing director of the Wabasso Cotton Co. Ltd., Trois-Rivières. He kept all the members and guests very interested throughout the evening with his illustrated talk on the Rucker plan which is being applied successfully by his Company. Under the plan, the labourers share, above and beyond their normal wages, a proportion of the net profit, the proportion having been mutually agreed upon by representatives of the "tool users" and the "tool owners".

Also, during October, the Junior Section was very fortunate in having a field trip to the recently completed No. 3 Power House of the Shawinigan Water and Power Company at Shawinigan Falls. The installation is truly a 1949 model power house having three 65,000-k.v.a. generators supplying power to the local area and to Montreal. Especially noticeable among all the equipment was the 120-ton Hackbridge transformer recently imported from England and installed within the month. All were impressed by the control room where, within a few square feet, all the generated energy can be ultimately apportioned as required to countless useful ends.

Toronto

G. H. Rogers, M.E.I.C.
Secretary-Treasurer

M. W. Huggins, M.E.I.C.
Branch News Editor

Two hundred and fifty members of the Toronto Branch attended the opening meeting of the 1949-50 session on October 20, 1949, to hear Dean K. F. Tupper of the University of Toronto Faculty of Applied Science and Engineering present an informative and thought provoking paper entitled **What Price Engineers.**

Dean Tupper selected, as his main thesis, a discussion of the operation of the economic law of supply and demand as it affects the employment and remuneration of professional engineers. His thorough explanations of his study of the operation of this law was designed to answer the constantly present question, as to the effect of the present and future unusually large graduating classes on the economic status of the countries' engineers.

He stated that he was "not the least bit apprehensive about the effect of this influx". He produced figures showing the rate of growth of the engineering body in Canada which indicated that we are still on a steeply rising demand curve and as additional evidence he gave figures showing the rates of increase in demand for electric power and telephones.

From precise figures set up by the Wartime Bureau of Technical Personnel, adjusted to take account of estimated losses and gains since 1946, Dean Tupper obtained a round number of 25,000 engineers at present practising in Canada.

Assuming retirement at age 65 and usual mortality rates, he stated that 1,000 graduates per year would be required to maintain an engineer population of 30,000. The 1949 graduating class, the largest on record, is slightly over 3,000. In order to double this hypothetical 30,000 members of an engineering body in 5 years it would be necessary to graduate 7,100 men per year and to double it in ten years, 4,090 would be required.

Dean Tupper stated that by 1953 the number of engineers turned out by our Canadian schools should be back in the vicinity of 1,000 per annum.

He concluded by stating that he was vigorously opposed to artificial control of the engineer's remuneration by limiting the number of men trained as engineers. He stated that he preferred to permit the natural economic laws to act and that engineers should make every effort to make our profession as valuable as possible by making an honest and valuable contribution to the society in which we live.

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On Thursday evening, November 3, the Toronto Branch held one of its best attended meetings in the new Wallberg Memorial Bldg., when some **Engineering Features of the New Bank of Nova Scotia Building, King and Bay Streets, Toronta,** were discussed by the consulting structural, mechanical and electrical engineers and the contractor. The attendance of about 300 was far in excess of the capacity of the lecture room. The large attendance however seemed to act as an inspiration to the speakers who presented three very interesting papers. The interest of the audience was such that the meeting lasted considerably longer than had been planned.

The first speaker, Mr. C. D. Carruthers, associate of Gordon L. Wallace, the consulting structural engineer, outlined the history and structural features of the job, particularly the use of the Q-type light gauge steel floor and the resulting special wind bracing problems which had to be dealt with. This was the first application of the Q-type floor in the Toronto area and as a result a few new and unusual problems were presented to the structural engineers. Mr. Carruthers discussed the construction details as slides were shown indicating the various stages of the work. Foundations were carried to rock and the excavation was handled in such a manner as to cause the minimum possible disturbance to adjoining buildings and streets. The largest column load in this 26 storey building was about 3½ million pounds.

Dr. Karel Rybka the consulting mechanical and electrical engineer, presented an extremely interesting paper describing the numerous and difficult mechanical and electrical problems which had to be solved in obtaining an economical and efficient design of this important structure. He explained how the high rental value of the property made it necessary to reduce heating and air conditioning ducts to the minimum possible size. This resulted in the use of high velocity air with diffusers in the rooms and various other modifications to produce the desired conditions. The atmospheric conditions will be controlled from three levels; the penthouse, the fan room on the 5th floor and, the basement. Radiators will be placed below windows, which will be double glazed throughout. Dr. Rybka stated that he considered this desirable so as to avoid uncomfortable conditions in the vicinity of the windows in the winter.

Dr. Rybka explained that incandescent lighting rather than fluorescent lighting had been adopted because of the $200,000.00 reduction in initial cost. It would have taken many years to recover this added expense through power savings.

Because of the imminent change over from 25 to 60 cycle current throughout Ontario it was considered desirable to install 60 cycle equipment immediately even if it became necessary to use converters temporarily. However, through the Hydro-Electric Power Commission of Ontario, arrangements were made to have 60 cycle current made available This resulted in very considerable savings.

Mr. C. E. Parrish of the J. L. E. Price and Co., contractors, was the final speaker. He presented a brief but very interesting paper describing the numerous difficulties encountered in erecting such a large building on a lot of the exact size of the building and bounded on two sides by two of Toronto's busiest downtown streets and on the other two by buildings which had to be underpinned to a depth of about 30 ft. He described the methods of excavation and underpinning and the precautions which were taken to eliminate building and street settlement. In spite of all precautions, due to drying out of the clay the corner of King and Bay Streets has settled from three to five inches. The underpinning of the adjacent buildings was completely successful, however, and as a result no cracking of the walls occurred.

A special truck hoist was designed for the project to make it possible to load trucks for the removal of the excavated material. This proved very valuable and resulted in considerable savings.

Mr. Edgar Cross moved a hearty vote of thanks to the speakers on behalf of the Branch. The audience was enthusiastic in its applause. In view of the lateness of the hour there was no time available for discussion.

On Saturday morning, November 5, the members of the branch had a further opportunity to learn about the structure on a field trip arranged through the courtesy of the branch and the contractor. Another very large attendance indicated the considerable interest of Toronto engineers in this project.

Vancouver

Alan Fletcher, M.E.I.C.
Secretary-Treasurer

Stuart S. Lefeaux, Jr.E.I.C.
Branch News Editor

On Wednesday, October 19 the Vancouver Branch was honoured with an address on **Atamic Energy** by Dr. G. M. Volkoff. Many questions were asked Dr. Volkoff on the industrial uses of free isotopes and radioactive tracers, the conclusion reached was that the industrial applications are increasing daily. Chairman George Allen thanked Dr. Volkoff for his clear and simple handling of a subject that has been much distorted by newspaper and magazine publicity.

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The first week in November was highlighted for the Vancouver Branch executive and members by the visit of President John E. Armstrong and Dr. Austin Wright on November 3rd and 4th. On November 3rd a visit to the School of Military Engineering at Chilliwack and a Branch Officers dinner meeting took place, with a visit to the University of British Columbia and the Annual Presidential Dinner on November 4th. President Armstrong gave a most inspiring talk to the members on the growth and expansion of the Institute and the general secretary once again proved he was keeping ahead of all activities affecting engineers throughout Canada.

The executive and members of the Vancouver Branch wished the Presidential party a happy return to Montreal and are looking forward to a prosperous year for the Institute.

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The annual dinner meeting of the Vancouver Branch was held on Saturday, November 19, in the York Room of the Hotel Georgia, with approximately 70 present. Mr. J. B. Snape of Jasper, an Edmonton Branch member, was a visitor for the evening.

The minutes of the last annual meeting and the financial statement were adopted as presented. The retiring Chairman George Allan, gave a brief report on the year's activities. The branch lost five members through death, and three members attained the position of life membership. The total membership of the Vancouver Branch is now 906, made up as follows: 1 honorary member, 283 members, 110 juniors, 504 students, and 8 affiliate members. The branch held six lecture meetings, four field trips and two presidential meetings

(*Continued on page 851*)

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

December 20th, 1949

The By-Laws provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and selection of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described at the January meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility. Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least our years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

An **Affiliate** shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BULINS—KARLIS, of Corner Brook, Nfld. Born at Riga, Latvia, April 11, 1906. Educ.: Engr. Technologist, Univ. of Latvia. 1931. 1930, (5 mos., dftsman., paper and pulp mills, Sloka, nr Riga; 1932, (6 mos., engr., boiler erection and tests, Riga Wool Manufacturers Ltd.; 1932, (6 mos., engr., boiler erection and tests, Krustpils Sugar Mills, Latvia; 1932-35, engr. dftsman., Liepaja Steel Mills, Latvia; 1935-37, operating engr. and supvr., Riga Municipal Water Pumping Plant; 1937-44, tech. mgr., steam power plant, Jelgava, Latvia; 1944-45, engr. drftsman., Preussische Elektrizitats A. G. Abt., Hannover, Germany; 1948 to date, engr. dftsman., The Bowater's Newfoundland Pulp & Paper Mills Ltd., Corner Brook, Nfld.

References: W. R. Hughson, E. Hinton.

CARTER—HENRY BAIRD, of Corner Brook, Nfld. Born at St. John's, Nfld., Dec. 31, 1922. Educ.: B.Eng., McGill, 1945. 1941 (summer, lab. asst., materials testing lab., Shreve, Lamb & Horman, St. John's, Nfld.; 1943, (summer), lab. asst., fish meal and oil reduction plant, James Baird Ltd., Labrador; 1944, cannery foreman, General Seafoods Ltd., Ingonish, N.S.; with Bowater's Nfld. Pulp & Paper Mills Ltd., Corner Brook, Nfld., as follows: 1946-49, asst. elect. engr. on design and instln. of 250 ton extension to pulp and paper mill incl. 66,000 volt substation changes to transmission line relaying mill dist., etc., 1949 to date, design, layout and instln. for renovation and mtce. of 1,000 ton pulp and paper mill.

References: W. A. Hughson, E. Hinton, J. M. Hopkins, A. D Foulis, G. J. T. Gunn, E. Dickinson, E. L. Baillie, C. D. Martin.

CHASE—CARMAN HARVEY, of Sault Ste. Marie, Ont. Born at Peterborough, Ont., March 3, 1922. Educ.: B.A.Sc., (Mech.), Toronto, 1949; 1941-42 (8 mos.), and 1945 (4 mos.), apprent. dftsman., Canadian General Electric Co., Peterborough, Ont.; 1949 (May 1st), asst. mech. engr. (car shop), Algoma Central & Hudson Bay Railway Co., Sault Ste. Marie, Ont.

References: D. C. Holgate, A. M. Wilson, O. A. Evans, L. R. Brown.

COLQUHOUN—CHARLES GEORGE, of Montreal, Que. Born at Ottawa, Ont., March 6, 1919. Educ.: B.Sc., (Civil), Queen's, 1943; R.P.E., Ontario; 1940 and 1941, (summers), instru'man., Ottawa Suburban Roads Comm.; 1942, (summer), Surveys & Engrg. Br., highway location and constrn., nr. Prince Rupert, B.C.; 1943-45, Lieut., R.C.E.; 1945-47, engrg. asst. toll engrg. dept., Toronto, London and Windsor, Bell Telephone Co. of Canada; 1947 to date, design engr., engaged in feasibility and design of hydraulic structures, Power Corporation of Canada, Montreal, Que.

References: A. W. Finlayson, C. N. Mitchell, N. S. Swan, J. S. H. Wurtele, G. H. Kohl.

COOK—GEORGE EARL, of Winnipeg, Man. Born at Kyle, Sask., Dec. 26, 1924. Educ.: B.Sc., (Agric. Engrg.), Saskatchewan, 1947; with Imperial Oil Limited, Winnipeg, Man. 1947-48, lubrication training course, 1948 to date, lubricaton engr.-sales representative.

References: N. B. Hutcheon, I. M. Fraser, C. V. Antenbring, R. Peterson, G. L. Macpherson.

DIMOCK—CONSTANT GRAHAM, of Kitchener, Ont. Born at Windsor, N.S., Dec. 18, 1907. Educ.: B.Sc. (Elect.), 1930; Canadian Westinghouse Co., Hamilton, as follows: 1930-32, graduate engrg. course, 1932-36, test engr., compiling test data, working up performance curves and obtaining approval same from various engrg. divisions, fractional H.P. motors, induction motors, transformers, etc.; 1936-38, fractional H.P. motor design engr., metal products divn., improving rating and widening scope of application for shaded-pole motor, assisting in design winter air conditioner, Dominion Electrohome Industries; 1939-43, in sanatorium; 1947 to date, elect. and mech. inspector, Dominion Electrohome Industries, Kitchener, Ont.

References: J. T. Thwaites, D. W. Callander, W. J. Fargo, S. Shupe, J. A. Vance.

ELEFTHEROUDAKIS—PAUL, of Montreal, Que. Born at Athens, Greece, Dec. 29, 1921. Educ.: Diplome Ingenieur, Mech., 1947; Elect., 1948, Athens Univ.; Postgrad. studies at M.I.T.; 1947-49, design, Panou & Papaioannou, consultg. engrs., Athens, Greece; at present, studying at McGill for Master's Degree in Engineering.

References: W. H. Schippel, G. A. Wallace, C. V. Christie.

ELLIOTT—HAROLD BROWN, of Montreal, Que. Born at Brownsville, Ont., April 30, 1904. Educ.: B.Sc., (Mech.), Queen's, 1928; 1928-30, industrial engr., Cincinnati Milling Machine, Cincinnati, Ohio; 1931 to date, industrial engr., wage incentive systems, plant layout, methods engrg., tooling, tool room, Northern Electric Co., Limited, Montreal, Que.

References: D. S. Ellis, E. U. Gage, A. S. Runciman, R. E. Heartz, C. A. Barbour, W. E. Patterson, J. J. H. Miller, E. H. Hayes.

HADLEY—HENRY MOFFAT, of Montreal, Que. Born at Montreal, May 5, 1925. Educ.: B.Eng. (Mech.), McGill, 1943; 1942-43-44-46-47, (summers), sheet metal helper, Henderson Barwick Co.; machinist, class II, Defence Industries Limited; rodman, City of Verdun; jr. dftsman., Darling Bros. Ltd.; jr. engr., Steel Co. of Canada Limited; 1948 to date, mech. engr., design, mtce. and instln. of plant machinery and equipt., Steel Co. of Canada, Montreal, Que.

References: P. E. Jarman, J. A. Lalonde, F. Y. Dorrance, C. A. Robb, E. C. Kirkpatrick.

HAINS—DONALD HASPER, of Hamilton, Ont. Born at Montreal, Que., June 27, 1917. Educ.: B.Eng., (Metall.), Queen's, 1948; 1937-42, student apprent., foreman, electric galvanizing, welding wire depts., responsible production, experiment and develop't. of electrode coatings, Steel Co. of Canada, Montreal; 1942-45, Lt. Eng., R.C.N.V.R.; 1945 to date, cold reduction and tinning process, methods and control, Steel Co. of Canada, Hamilton, Ont.

References: E. C. Kirkpatrick, G. E. Shaw, E. T. W. Bailey, D. S. Ellis, A. B. Dove.

HERRON—WILLIAM ALEXANDER, of Montreal, Que. Born at Ayr, Scotland, May 8, 1904. Educ.: Diploma, Engrg., Falkirk H. S. (affiliated Royal Tech. College, Glasgow, 1921-24; Academy of Engrg., Glasgow, 1927-29; A.M., I.M.E., London; 1921-26, apprent., Grennock & Grangemouth Dockyard Co., Ltd.; 1926-27, (apprent. of two yrs.), erection and testing of patent wood-working machy., etc., M. Wylie & Co., Ltd., London; 1927-32, positions up to and incl. chief engr., marine engrg., coal and oil-fired steam generators, reciprocating and turbine machy., of shaft H.P. up to 8,000, etc., Queen Line, Glasgow, Kay Houston Lines, London; 1932, marine engrg., Diesel, Lyle Lines, Glasgow; 1938, positions up to and incl. sr. second engr., large single and twin screw motor vessels, acting as chief engr. during extensive overhauling, dry-docking, surveying in U.K., Dominion, etc.; 1938-39, mech. engrg., power stn., charge engr., Clyde Valley Electrical Power Co. Ltd., generating capacity, 90,000 K.V.A., etc.; 1939-46, engr. surveyor, Scottish Boiler and General Insurance Co., Ltd., government examination and cert. of plant, responsible for examination and certification under appropriate Acts of all classes steam generators and pressure vessels, etc., etc.; at present, asst. supt., bldgs. and grounds, complete supervn. of all tech. structural and financial problems related to McGill, Macdonald College, Dawson and Peterson Residences, incl. supervision of Univ. and College power stations, etc., McGill University, Montreal, Que.

References: C. A. Robb, J. J. O'Neill, W. B. Ross, C. V. Christie, W. H. Schippel, D. L. Mordell, W. A. Gilmour.

KAHAN—JERZY GEORGE, of Montreal, Que. Born at Warsaw, Poland, July 17, 1905. Educ.: Radioelect. Engr., Ecole Superieure d'Electricite, Paris, 1928; R.P.E., Ontario; M., Assn. Polish Engineers in Canada; with National Institute of Telecoms., Dept. of Transport, Warsaw, Poland, as follows: 1928-34, asst. engr., 1934-39, engr. i/c divn. of measurements and standards; 1937-39, tech. adviser, central office Weights and Measures, Warsaw, Poland; with Les Laboratoires L.M.T. (Branch of I.T. & T.), Paris, France, as follows: 1940-44, develop engr., 1944-45, engr. i/c of development lab., 1945-46, engr. i/c engrg. lab., 1946-48, chief elect. engr.; 1948-49, consultg. engr., Rogers Majestic Ltd., Toronto, Ont.; 1949, develop't. engr., Radio Engineering Products Ltd., Montreal, Que.

References: J. Pawlikowski, Z. S. Cyma, B. Szczeniowski, M. M. Winred, A. Bielinski.

LINDSAY—ROBERT JOHN, of Montreal, Que. Born at Thetford Mines, April 10, 1924. Educ.: B.Eng., (Civil), McGill, 1948; R.P.E., Quebec; with M. D. Barclay Inc., as follows: 1940-45, (summers), chainman, instru'man., asst. surveyor and asst. engr., 1945, (summer), res. supervisor on sewer constrn. and constrn. of pump-house, 1946, (summer), res. supervisor on roadways, and completion of sewer constrn., 1947, (summer) and in 1948 to date, surveyor i/c field parties upon engrg. and land surveys for constrn. and property titles, also, principal asst. to consulting engr. and land surveyor in private practice, and jr. partner in company.

References: R. DeL. French, G. J. Dodd, R. E. Jamieson, G. M. Wynn, C. C. Lindsay.

MARKLEY—MAURICE JOSEPH, of Halifax, N.S. Born at Halifax, N.S., March 22, 1908. Educ.: B.Sc. (Mech.), N.S.T.C., 1930; 1930-31, engrg. work, Avon River Power Co.; 1931, engr., Dept. of Highways, road constrn.; 1932-33, teacher, engrg. dept., St. Mary's College, Halifax; 1934-36, engr., Pier "B", National Harbours Board, Halifax; 1937, inspector, Milton Hersey Co., Montreal; engr., steam dept. and lab., Mersey Power Co., Liverpool, N.S.; 1939-40, engr., dredging, wharf constrn., etc., Dept. of Public Works; 1941-42, instru'man, Dept. of Transport; 1946-47, engr., demolition, War Assets Corporation; 1947, engr., Construction Equipment Co., Halifax; 1947-48, engr., heating and aircond., Hagen & Co., Halifax; 1948-49, instru'man., Canadian National Railways, Halifax; 1949 to date, engr., on constrn. Pier 3, supervising concrete work on cribs, National Harbours Board, Halifax, N.S.

References: L. B. Feetham, H. W. Thorne, W. W. Downie, L. P. Lusby, G. C. Hault.

MONAHAN—HENRY STEPHEN, of Arvida, Que. Born at Toronto, Aug. 24, 1922. Educ.: B.A.Sc., (Chem. Engrg.), Toronto, 1948; 1948 to date, jr. engr., Aluminum Co. of Canada, Arvida, Que.

References: T. T. Anderson, G. M. Mason, F. G. Barker, F. G. Barker, R. W. J. Lewis, C. J. Tanner.

NISBET—JAMES DUNCAN, of Sarnia, Ont. Born at Miri, Sarawak, Borneo, Feb. 15, 1926. Educ.: B.Sc., Michigan State College, 1949; 1943-46 (summer mos.), fireman & tool dresser, International Water Supply Ltd.; 1946 (spring), surveyor, Coles-Jefferey; 1947-48 (summer mos.), surveyor & dftsman, Polymer Corporation; 1949 (4 mos.), jr. engr., H.E.P.C. of Ontario; at present, engr. & water commissioner, Township of Sarnia, Ont.

References: G. R. Henderson, D. P. Herring, C. P. Sturdee, W. A. Williams, A. J. Jeffreys, E. V Buchanan.

ROSE—WILLIAM EDWIN, of Sydney, N.S. Born at Vancouver, B.C., Nov. 13, 1925. Educ. B.A.Sc., 1948; M.A.Sc., 1949, (Chem. Engrg.), British Columbia; 1948, (summer), dftsman., Imperial Oil Limited; 1948-49, lecturer, Univ. of British Columbia; 1949 to date, jr. engr., research and develop't. dept., Dominion Steel and Coal Corporation, Sydney, N.S.

References: N. A. Parlee, J. N. Finlayson, J. Prince, A. Peebles, C. N. Murray.

ROWAND—JOHN ALLAN, of Edmonton, Alta. Born at Bethune, Sask., July 18, 1923. Educ.: B.Sc., (Civil), Saskatchewan, 1947; R.P.E., Alberta; 1941-42-43, (summers), P.F.R.A., rodman; Ducks Unlimited, party chief; 1943-44, res. engr., Dept. of Mines & Resources, Ottawa; 1944, location engr., Dept. Public Works, British Columbia; 1944-45, R.C.E.; 1946, (summer), field engr., City of Saskatoon; 1947, highway engr., Public Works Dept., Alberta; 1947-48, supt., F. W. Rogerson, contractor; 1948 to date, consultg. engr., municipal utility design, instln., supervision, bldg. contrn., Ripley & Associates, Edmonton, Alta.

References: H. A. Ripley, N. A. Lawrence, J. E. Poole, C. R. Forsberg, R. A. Spencer, H. M. Weir, L. S. Keith.

SAKELLARIOU—THEODORE, of Montreal, Que. Born at Athens, Greece, Feb. 2, 1923. Educ.: Diplome Ing., Athens Univ., 1946; 1948, (3 mos.), design engr., Penhoet, St. Nazaire, France; 1948, (1 mo.), engr., Maison Breguet, Paris, France; 1948, (6 mos.), design engr., B.E.M.O., Paris; 1948-49, (8 mos.), design engr., Smulders, Liege, Belgium; at present, studying for Master's Degree in Engrg., McGill University, Montreal, Que.

References: W. H. Schippel, G. A. Wallace, C. V. Christie.

SHALLENBERGER—JOHN BUGHER, of Montreal, Que. Born at Pittsburgh, Pa., April 10, 1917. Educ.: B.A. in Engrg., Stanford Univ., Palo Alto, Calif., 1939 (acc. E.C.P.D.); 1937, (summer), carpenter, Wagner Construction Co.; 1937-38, reporter, Oakland Tribune; 1938-39, reporter, San Francisco Examiner; with Douglas Aircraft Co. Inc., as follows: 1938-42, student engr., 1942, tooling engr., 1942-43, materials engr., 1943, prod. control supervisor, 1943-44, sales engr. and asst. Washington representative; 1944-46, U.S. Marine Corps—with rank Engrg. Officer; 1946-47, Washington rep., Douglas Aircraft Co. Inc., Santa Monica; (1946 to date—president, Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.); with Canadair Limited, Montreal, Que., as follows: 1947-49, overseas representative, 1949 to date, assistant to the president

References: B. W. Bing, T. A. Harvie, L. Wiebe, E. C. V. Norsworthy, J. Sobolewski, J. T. Dyment.

THOMPSON—ELMER ANDREW, of Montreal, Que. Born at New Westminster, B.C., June 11, 1920. Educ.: B.A.Sc., (Forest Engrg.), B.C., 1942; R.P.E., Quebec; 1939-41, seasonal employment with B.C. Forest Service as asst. ranger; 1942, compassman on timber cruising, H. Gardiner & Co.; 1942-45, R.C.A.F.; with Dominion Tar & Chemical Co. Limited, as follows: 1945-46, plant engr. and asst. supt. of Edmonton plant, Creosoting divn., plant mtce. and operation under supervision of supt., 1946 to date, asst. supt., supervision of personnel, operations and mtce. of several plant, creosoting divn., Montreal, Que.

References: J. H. Palmason, J. A. Coote, J. G. Welsh, J. T. Howley, S. I. Gislason.

TREMBLAY—EDMOND, of Shipshaw, Que. Born at St. Felicien, Que., Aug. 24, 1908. Educ.: B.Sc., (Mech.), Queen's, 1938, with Aluminum Co. of Canada, as follows: 1938, (4 mos.), sales dept., Toronto, 1938, (2 mos.), Aluminum Laboratories, Montreal, transmission lines, 1938-40, genl. plant mtce., Shawinigan Falls, 1940-41, heat treat. dept., Shawinigan, 1941, (9 mos.), tech. control and testing, Shawinigan, 1941-42, system distr., Saguenay Transmission Co., 1942-45, mech. engr., Shipshaw, Develop't., 1945 to date, mech. engr., power plant, Shipshaw, also for Passe Dangereuse, Lake Manouan storage reservoirs.

References: McN. DuBose, A. C. Johnston, C. Miller, R. A. H. Hayes, F. L. Lawton, R. A. Lemieux, F. H. Duffy, A. Robert.

FOR TRANSFER FROM THE CLASS OF JUNIOR

BENNETT—GRAHAM A., of Welland, Ont. Born at New Glasgow, N.S., on Sept. 13, 1919. Educ.: B.Eng. (Mech.), Nova Scotia Tech. College, 1945; summers, 1941 and 42, Trenton Industries Ltd., Trenton, N.S.; 1943, machinists helper, Trenton Steel Works, Trenton, N.S.; 1944, dftsman., Frost & Wood, Smith's Falls, Ont.; with Plymouth Cordage Co. as follows: 1945-47, Jr. engr., design and development of cordage machinery and parts (rope and tying twines; 1947-49, asst. master mechanic, direction of mtce. work, heading of engrg. dept.; 1949 to date, superintendent, i/c plant operations, production and mtce., Welland, Ont. (St. 1945, Jr. 1947)

References: N. K. Cameron, W. D. Brownlee, H. L. Weaver, M. L. Baker, C. L. Mason.

CLARK—FREDERICK HUBERT, of Deer Lake, Nfld. Born at St. John's, Nfld., on March 24, 1919. Educ.: B.Eng. (Mech.), Nova Scotia Tech. Col., 1943: summers, 1937-39, topographical surveying, chainman, instrumentman, Dept. of Natural Resources; 1940, mechanic, McNamara Construction Co., Torbay; 1940-41, (17 mos.), asst. chief dftsman., United States Army Engrs., Fort Pepperrell, Nfld.; 1943-45, Aeronautical Engr. Officer, R.C.A.F., Ottawa; 1945-46, sales and service engr., Construction Equipment Co. Ltd., Toronto; 1946-47, design engr. Power plant, Canadair Ltd., Mtl.; at present hydro electric engr., Bowaters Nfld. Pulp & Paper Mills Co. Ltd., Corner Brook, Nfld. (St. 1943, Jr. 1946)

References: A. D. Foulis, W. L. Ball, G. W. Cummings, E. Hinton, W. R. Hughson, A. Vatcher, J. M. Hopkins.

FORSTER—JOHN WILLIAM, of Sao Paulo, Brazil. Born at Calgary, Alta., on Oct. 3, 1922. Educ.: B.Sc. (Civil), Univ. of Alta., 1944; M.Sc. (Hyd.), State University of Iowa, 1947; summers, 1941, rodman, P.F.R.A. survey party; 1942 and 1943, instrumentman; engr. at Constrn. camp; Ducks Unlimited; 1944, Jr. Engr. i/c survey part, irrigation surveys, P.F.R.A.; 1945-46, hydraulic engr. i/c field survey, report on water power, irrigation, drainage flood control studies, Dept. of Water Resources, Gov't. of Alta.; 1946-47, student and research asst., Iowa Institute of Hydraulic Research, Iowa City; 1947-48, lecturer in hydraulics, Dept. of Civil Engr., Univ. of Alberta; 1947 (summer), hydraulic engr. City of Edmonton Water Supply Dept., preparing drawings, estimates for proposed large feeder mains; 1947-48, part time work as acting provincial sanitary engr. Dept. of Health, Gov't. of Alta.; at present, hydraulic engr., cia Brasileira Administradora de Servicos Tecnicos, Sao Paulo, economic studies and preliminary design for future hydroelectric developments for companies subsidiary to the Brazilian Traction, Light and Power Co. Ltd. (St. 1943, Jr. 1946)

References: R. M. Hardy, B. Russell, W. R. Mount, D. R. Stanley, E. K. Cumming, T. A. Main, L. A. Thorssen, W. L. Foss.

GAVLAS—EDWARD HENRY, of Arvida, Que. Born at Melville, Sask., on June 28, 1918. Educ.: B.Sc. (Elec.), Univ. of Manitoba, 1941; R.P.E., Ont.; with English Electric Co. as follows: 1941-42, graduates training course; 1942, production planning dept. 1942-46, Canadian Army, O/I "B" section 1st Cdn. Radar Battery Workshop in the Field (Europe) 1946-47, private business, 1948 to date, asst. to protection engr. who is i/c protection and metering for Saguenay Power Generating & Distributing System, Aluminum Co. of Canada Ltd. (St. 1940, Jr. 1946)

References: W. W. McKernan, F. H. Duffy, J. W. Ward, A. Robert, J. T. Madill, A. C. Johnston.

GEAKE—LLOYD WOODROW, of Kenogami, Que. Born at Regina, Sask., on Sept. 1, 1918. Educ.: B.Sc., Sask., 1941; R.P.E., Que.; 1941-42, inspector, Aircraft Components, Civil Service Commission; 1942, (4 mos.), dftsman., Hamilton Bridge; 1942-46, Lieut. R.E.M.E. Can. Army O.S.; 1946-49, mech. engr., plant mtce. process design, machine design, layout work, heat and ventilating, reinforced concrete design, fan and pump design, Price Bros & Co., Kenogami. (St. 1940, Jr. 1945)

References: A. Cunningham, A. B. Sinclair, P. C. Leboutillier, N. F. McCaghey, H. O. McInerney.

GRIESBACH—ROBERT JOHNSTON, of Montreal. Born at Montreal on August 5, 1920. Educ.: B.Eng. (Civil), McGill, 1942; R.P.E., Que.; 1942-45, field engr. Foundation Co. of Canada; 1945-49, structural engr., Surveyer, Nenniger & Chenevert; at present, engr., O. J. McCulloch & Co., Consulting Engrs., wharves, docks, harbour works. (St. 1942, Jr. 1945)

References: O. J. McCulloch, E. Nenniger, F. G. Rutley, R. F. Shaw, W. C. Fingland, C. N. Mitchell, L. C. Jacobs.

HOGANSON—GEORGE HOWARD, of Moncton, N.B. Born at Halifax on March 29, 1919. Educ.: B.E. (Civil), Nova Scotia Tech. Col., 1947; summers, 1941, rodman, Federal Dept. Public Works; 1941-42, Jr. Engr. Dept. Nat. Defence; 1942, instru'man, Dept. of Transport; 1942-45, Aeronautical Engrg. Branch; 1946, asst. resident engr. Dept. Highways, N.S.; 1947-49, Jr. asst. Engr., C.N.R.; 1949 Feb.-Oct., instru'man; October to date, asst. engr. to regional chief engr. and his principal asst., work includes, supervising major projects, estimating, design, track layout, mtce. of way C.N.R. (St. 1947, Jr. 1949)

References: S. Ball, M. L. Baker, J. F. Kelly, J. W. March.

KENNEDY—JOHN FREDERICK, of Montreal. Born at Moncton, N.B., on July 29, 1921. Educ.: B.Sc. (C.E.) New Brunswick, 1941; summers, 1938, student asst. Dominion Forestry Service; 1939, surveyor, Miramichi Lumber Co., Minto, N.B.; 1940, instru'man and office mgr. R.C.A.F., Lakeburn Airport; 1941, aircraft inspector, supervision of firm's inspection, mfg'n. processes, British Air Commission; 1941-42, surveyor, McNamara Constructon Co., Goose Bay, Labrador; 1942-43, Jr. Officer, R.C.E.; 1944-45, district engr., eastern lines, C.P.R. Air Lines, responsible for repairs, modifications to aircraft in district; at present, design dftsman., structural steel reinforced concrete, Shawinigan Engineering Co. Ltd. (St. 1941, Jr. 1944)

References: J. A. McCrory, R. E. Heartz, W. H. Sharples, E. O. Turner, R. M. Carmichael, J. C. Blair-McGuffie.

McELROY—GEORGE ROBSON, of Montreal. Born at Regina, Sask., on April 30, 1916. Educ.: B.Sc. (Mech.), Univ. of Sask., 1942; summers, 1934-41, various jobs, helper, operator of small electric and diesel locomotives, Horseshoe Lake Mining Co., Ormiston, Sask., 1942-44, mech. engr. supervising repairs, mtce. equipment used in open pit mining operations and railroad constrn., also supervised operation Cat Ituni Mine of pumping station and diesel power plant, Demerara Bauxite Co., Mackenzie and Ituni, B.G.; with Aluminum Co. of Canada as follows: 1945 (2 mos.), trainee; 1945 (8 mos.), mech. engr., repairs, mtce. of equipment in The Carbon & Alpaste Plants; 1945 to date, engr. assisting project engr. on process design and layout, estimating, Cdn. Industries Ltd. (St. 1942, Jr. 1944)

References: I. M. Fraser, M. S. Macgillivrary, C. Jackson, W. K. Cowan, W. G. Stuart, B. A. Evan.

PREBOY—JOSEPH WILLIAM, of Thetford Mines, Que. Born at Fox Valley, Sask., on Sept. 23, 1919. Educ.: B.Sc. (Mining), Alberta, 1942; R.P.E., Que.; summers, 1940 and 41, underground mining, labourer; International Nickel Co., Sudbury; with Eldorado Mining & Refining as follows: 1942-43, jr. engr. 1943-45, asst. engr.; 1945-46, mine shift boss; 1946 (9 mos.), chief survey engr. Eldorado Exploration; 1946-47, field engr. Grant Mills Construction in building of reinforced concrete headframe and crusher house for East Malartic Gold Mines; 1947 (9 mos.), field engr. Eldorado Exploration in Lake Athabaska, i/c of exploration camps, Sask.; 1947-48, mine shift boss, East Malartic Mines, Norrie, Que.; 1948 to present, engr. on constrn. and design of new asbestos mill for Asbestos Corporation at their British Can. Mine, Black Lake, Que. (St. 1942, Jr. 1945)

References: E. J. Boler, R. M. Hardy, I. F. Morrison, L. A. Thorrsen.

WEBSTER—GORDON FREDERICK, of Montreal. Born at Elbow, Sask., on Aug. 3, 1915. Educ.: B.Sc. (Ceramic Engrg.), Sask., 1942; R.P.E., Ont.; summers 1939, rodman, P.F.R.A.; 1940, airport constr. Dept. Transport; 1941, Instru'man, P.F.R.A.; 1942-43, Lieut. R.C.E.; 1943-44, estimating and constrn. engr., Ward McKes Engineering; with McColl Frontenac Oil Co. Ltd., as follows: 1944, asst. engr., Toronto Refinery; 1946, resident engr., Toronto Refinery; 1946-47, project engr., Texas Co., New York; 1948 to date, resident engr., Montreal East Works, McColl Frontenac. (St. 1942, Jr. 1943)

References: A. G. Farquharson, W. N. McCann, E .H. Brooke, J. E .Oles, R. A. Spencer, J. A. Alexander.

WILSON—WILLIAM HENRY, of Montreal. Born at Scotstown, Que., on April 11, 1920. Educ.: B.Eng. (Mech.), McGill, 1942; R.P.E., Que.; with Algoma Steel Co., summers as follows: 1940, general machine shop work; 1941, quality control iron foundry; with United Shipyards Ltd., as follows: 1942-44, material engr. i/c piping; 1944-45, piping engr.; 1945 to date, asst. engr., E. A. Ryan, Consulting Engineers. (St. 1942, Jr. 1946)

References: E. A. Ryan, F. A. Combe, W. J. Routly, B. D. McDermott, W. J. McAdam.

NEWS OF THE BRANCHES

(*Continued from page 848*)

during the year. Past President, Dean J. N. Finlayson, moved a vote of thanks to the retiring chairman and executive for the splendid work accomplished during the year. He also complimented the U.B.C. student section on its increase in enrolment during the year.

The report of the nominating committee for the 1950 executive was adopted as presented. The executive, therefore is as follows: Sidney Hogg, chairman; J. E. Macdonald, vice-chairman; A. G. Fletcher, secretary-treasurer; members of the executive, Fred Adams, Richard Walkem, S. H. de Jong, and John Webster. In the absence of Sydney Hogg, who was en route to England, J. E. Macdonald took the chair.

Mr. Macdonald's first duty was to introduce Dr. Gordon Shrum, O.B.E., M.M., M.A., Ph.D., F.R.S.C., head of U.B.C. Physics Department, who spoke on **Atomic Power and Its Place In Industry.** Dr. Shrum introduced his subject with a short lecture on elementary physics and told of the research work being done in Canada on the problem of "nuclear" energy. Uranium fission is not the only field being explored; the far greater field of hydrogen fission is the objective of much research.

Dr. Shrum was not too optimistic on the possibility of using nuclear energy for industrial purposes in the next few years. There are many problems to be overcome before it can be made economically possible.

On concluding his address, Dr. Shrum extended a kind invitation to the branch members to visit the new Physics department at U.B.C. to see research work on nuclear physics in progress.

H. N. MacPherson, vice-president of the Institute, thanked Dr. Shrum for his thought provoking address and assured him that all the branch members could now call themselves authorities on atomic energy and the problems of nuclear physics.

Victoria

D. A. MacLean, jr.e.i.c.
Secretary-Treasurer

T. A. J. Leach, m.e.i.c.
Branch News Editor

President and Mrs. J. E. Armstrong visited Victoria on November 1, accompanied by the General Secretary L. Austin Wright.

During the afternoon an informal meeting was arranged with the branch officers, at which various Institute affairs were discussed.

Later, in the evening, a banquet was held in the Empress Hotel with R. Bowering presiding as chairman.

Mr. Armstrong, in his opening remarks, indicated the steady increase in Institute membership to the present total of 12,000 which is evenly divided between corporate and junior or student members. This widely scattered membership is served by 31 Branches with an overall total of 500 officers.

What each individual member gets out of the organization depends on what he is willing to give to it. The president stressed that professional status cannot be acquired by legislation but only by a growing professional consciousness by the engineer, which in turn is recognized by the public.

In an effort to make Canadians familiar with Canadian Engineering talent an inventory of all consulting engineers within the country is being compiled by the Institute and it is hoped that this will be available by 1950. Mr. Armstrong pointed out that in some instances foreign engineers were being employed in this country to do jobs that could be done as well or better by local engineers.

Following the presidential address, Dr. Austin Wright, the general secretary spoke for a few minutes on Institute affairs. The main voice of the Institute is *The Engineering Journal* which has now reached a circulation in excess of 13,000 copies. Its cost per month runs in excess of $5,000 and with increasing revenue from advertising it is hoped to break even in the near future.

The members are concerned with regards to the lifting several years ago of the tariff on American engineering plans. This has tended to increase the import of American men and goods.

Another disturbing factor is the existing set up of the International Joint Commission, whose duty is the allotment of International water. Of the three members in the American section, two are engineers, whereas the Canadian section has no technical men on its staff and at present consists only of two members. The Institute is urging the existing vacancy be filled by an engineer.

Major R. C. Farrow moved a vote of thanks to the speakers and the meeting was adjourned.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

ELECTRICAL

ENGINEER, electronics field, with considerable experience on inspection methods and organization. Salary $3,480 to $4,080 depending on qualifications. Position in Ottawa. Apply to File No. 1204-V.

ELECTRICAL ENGINEER with at least three years of post graduate professional experience in the field of radio engineering in very high frequencies telecommunication and/or radar. Location Montreal. Salary open. Apply to File No. 1314-V.

ELECTRICAL DRAUGHTSMAN experienced in the design of electrical installations principally lighting and power layouts in industrial plants. Location Montreal. Salary open. Apply to File No. 1320-V.

MECHANICAL

JUNIOR MECHANICAL ENGINEER required by an electrical manufacturing plant in Ontario to be in charge of their suggestion system plan. Applicant must have initiative and be capable of working with people. Salary open. Apply to File No. 1316-V.

MECHANICAL ENGINEER with sales ability and experience in markets and product development work required by a manufacturer located outside of Montreal. Preferably bilingual. Good opportunity for advancement to the position of sales manager. Salary open. Apply to File No. 1319-V.

RECENT GRADUATE in mechanical engineering required by a paper company in the Province of Quebec. Preferably bilingual. Salary open. Apply to File No. 1322-V.

METALLURGICAL

METALLURGICAL ENGINEER required for research laboratory in Montreal Applicant must have some experience in steel industry with knowledge of gas and arc welding. Salary open. Apply to File No. 1326-V.

MISCELLANEOUS

CIVIL OR MECHANICAL ENGINEER required for position of assistant to general manager of a steel company in the Maritimes. Salary open. Company operates a steel foundry, structural and machine shops and employs approximately 300 men. Intelligence and the ability to learn quickly is essential. Apply to File No. 1313-V.

SALES ENGINEER, preferably civil background, required in Montreal. Salary open. Apply to File No. 1317-V.

ARCHITECTURAL DRAUGHTSMAN required for industrial concern doing mill buildings and extensions. Applicant should be familiar to a limited extent with structural design of reinforced concrete structures, steel structures and similar work. Salary open. Apply to File No. 1320-V.

ASSISTANT CITY ENGINEER required by City of Prince Albert, Sask. Duties will be general municipal engineering. Starting salary wil be $225.00 to $275.00 per month. Apply to File No. 1321-V.

SENIOR SALES ENGINEERS required by an electrical firm in Montreal. Equipment handled will be switchgear, high and low tension equipment, etc. Must have extensive sales experience. Salary $7,000 to $9,000. Age 35 to 40 years. Apply to File No. 1323-V.

RECENT GRADUATE required by manufacturer in Winnipeg. Applicant must be interested in production planning, time and motion study, etc. Work will be in connection with the setting up of a modern production program. Training period. Salary open. Apply to File No. 1324-V.

PHYSICIST OR MECHANICAL ENGINEER wanted to act as head of Nuclear Engineering Branch by National Research Council. Applicant will be required to direct a group of Physicists and Engineers in applied research and engineering development related to design of atomic energy plants and plant equipment. Salary $5,000 to $6,300. Apply to File No. 1325-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, recent Ph.D. or equivalent with good background in organic chemistry preferably along the lines of wood and cellulose chemistry and fuels technology. Applicant needs capacity for contacting plant personnel and appreciation of engineering phases of problems. Position in British Columbia. Salary open. Apply to File No. 1118-V.

CHEMICAL ENGINEER OR HONORS CHEMISTRY, recent graduate (1948-1949) required by a metallurgical and chemical company in Western Canada. Salary open. Apply to File No. 1271-V.

CHEMIST required for processed food plant in Montreal. Must be responsible for control of quality and developing process for solving formula problems due to variations in raw materials and methods of manufacture. Ability to write clear concise reports is essential Salary open. Apply to File No. 1275-V

CHEMICAL SALES ENGINEER required to work out of Montreal on sales and service principally in power plants. Business is well established and offers excellent opportunity for right man. Salary depends on experience. Bilingual desired but not essential. Apply to File No. 1301-V.

CIVIL

CIVIL ENGINEER with at least 2 years practical experience required by a large inter-municipal corporation in Western Canada. Under supervision and direction applicant must be able to assist and perform technical engineering work, prepare plans, perform field duties in connection with the construction and maintenance of simple structures, to install equipment and supervise and direct small groups of men. Salary $235.00 up. Apply to File No. 1144-V.

CIVIL ENGINEER with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 1285-V.

CIVIL ENGINEER age 40 to 50 years required by Public Institution for Montreal area. Must have construction experience and be able to supervise large building program. Salary open. Apply to File No. 1286-V.

ELECTRICAL

SENIOR ELECTRICAL ENGINEER required with 5-10 years experience for a large mining company in Quebec. Must be able to do layout and estimating for distribution and installation of electrical equipment on a large scale, previous experience in underground and open pit mines mill and factory. House available for a married man Salary open. Apply to File No. 1266-V.

ELECTRICAL ENGINEER, bilingual, required by a large firm in Montreal, for supervision of electric meter repair and testing, also testing of electrical equipment (transformers, switches, etc.) Age 28 to 35 years. Must have complete test course with either General Electric or Westinghouse Company and have five years previous experience in supervision. Salary open. Apply to File No. 1270-V.

SALES ENGINEER. Graduate electrical engineer. For large Canadian firm. Industrial electrical sales experience desirable. Location, Montreal. A permanent position with good future. Applicants should state previous experience and approximate salary expected. Apply to File No. 1299-V.

MECHANICAL

MECHANICAL ENGINEERS required in Ontario. The qualifications for the more senior of these positions are those of a person of considerable experience on machines as found in the Tool Engineering Department of the Automotive Industry. The other position requires the qualifications of a body layout engineer. Experience preferably obtained with the Automotive Industry. Salaries open. Apply to File No. 1268-V.

SALES ENGINEERS, graduates in mechanical engineering. Experience in refrigeration desirable. To act as company representative on territories, contacting dealers and assisting them in sales and service, by manufacturer of refrigerated equipment. Starting salary $3,000.00 to $3,600.00 per year plus expenses. Men required for Hamilton, Winnipeg, Edmonton and Vancouver. Apply to File No. 1279-V.

MECHANICAL ENGINEER preferably bilingual, about 35 years of age, for position of assistant to plant engineer in large industrial plant near Montreal. Position requires some knowledge of construction practices and ability to plan and supervise maintenance of industrial equipment. Good opportunity for advancement. Accommodation available. Apply to File No. 1288-V.

MECHANICAL ENGINEER required by a farm implement manufacturer in Ontario. Applicant should have experience in internal combustion engine or gear design. Salary open. Apply to File No. 1300-V.

SENIOR MECHANICAL ENGINEER required as sales manager by a tool and die manufacturer in Montreal. Applicant must have ability to handle general administrative duties including supervision of sales staff also ability to discuss technical problems in connection with production tools and machines etc. A reasonable knowledge of metallurgy would be valuable. Salary open. Apply to File No. 1304-V.

MECHANICAL ENGINEER required in England by leading paperboard manufacturer. Age 25 to 35 years. Some experience in maintenance and development preferred. Excellent opportunity for future advancement. Applicant to furnish full particulars of qualifications and experience. Salary open. Apply to File No. 1305-V.

METALLURGICAL

PHYSICAL METALLURGIST AND FOUNDRY METALLURGIST required in British Columbia. Applicant for former position must have broad background in physical metallurgy, including heat treating problems, corrosion problems, studies of failures in metals etc. Salaries open. Apply to File No. 1118-V.

MINING

MINING ENGINEERS required by a large company in the Province of Quebec. Two men with 2-5 years experience, must be able to do layouts. One with ten years experience in both underground and open pit mine operations. One with experience as mine safety director with two assistants. Houses available for married men. Salaries open. Apply to File No. 1266-V.

MISCELLANEOUS

GRADUATE ENGINEER for estimating required by well established steel fabrication company in Manitoba. Preference will be given to anyone having experience in estimating structural and plate fabrication-miscellaneous, ironwork and general machinery items. Applicants should state age, experience and salary expected. Apply to File No. 1272-V.

SENIOR INDUSTRIAL ENGINEERS required in Montreal. Applicants must be thoroughly experienced in production control, wage incentives and cost control and must be bilingual. Salary open. Apply to File No. 1276-V.

SALES ENGINEER with experience in sheet metal work, especially as applied to food service equipment for hospitals, hotels, etc., to design layouts and do contact work for firm already well established in this line. Salary and bonus system to competent man will ensure excellent income. Apply to File No. 1279-V.

STRUCTURAL STEEL DRAUGHTSMEN AND CHECKERS, preferably graduate engineers are required for a steel fabricating company in Manitoba. Salaries open. Apply to File No. 1285-V.

GRADUATE ENGINEER required by National Research Council to act as representatives of the Technical Information Service, with headquarters in Toronto. Work involves personal interviews and plant inspection with officers of industrial firms. Excellent experience for those interested in technical sales work. Salary up to $4,300 per annum, depending upon training and experience. Apply to File No. 1289-V.

COMBUSTION ENGINEER required for industrial concern near Montreal to take full charge of large boiler house and steam turbo generators. Technical knowledge, extensive operating, experience and practical mechanical ability required. Permanent position and attractive salary. Apply to File No. 1290-V.

GRADUATE ENGINEER with considerable experience in mechanical equipment for buildings is wanted for work on heating, ventilating and air-conditioning by a firm of consulting engineers in Montreal. Salary open. Apply to File No. 1291-V.

GRADUATE ENGINEER wanted for Montreal suburb. Applicant will be required to supervise outside work and should have construction and municipal experience. Salary $300.00 to $350.00. Apply to File No. 1292-V.

TWO SALES ENGINEERS required in Eastern Canada by an old established firm. Construction or industrial sales experience along general civil lines desirable but not essential for experienced applicants. Must be willing to travel from headquarters in Toronto or Montreal. Starting salary $200.00 to $300.00 per month depending on experience. All expenses paid. Bilingual ability desirable for Montreal position. Good prospects for early advancement. Apply to File No. 1302-V.

GRADUATE ENGINEER required by mining and industrial machinery manufacturer in Ontario. Applicant must be experienced in the design of tools, jigs, fixtures, dies, molds etc., also capable of making own drawings and supervising draughtsmen in detailing work. Salary open. Apply to File No. 1306-V.

GRADUATE ENGINEERS AND DRAUGHTSMEN required by a large inter-municipal corporation in Western Canada proceeding very shortly with the enlargement of their sewage disposal plant. Salaries open. Apply to File No. 1307-V.

GRADUATE ENGINEER primarily electrical background required for sales of electrical and allied machinery and to open branch office in Calgary. Must have at least two years selling experience. Salary open. Apply to File No. 1308-V.

ASSISTANT SUPERINTENDENT required in Windsor, N.S. Applicants must be graduate electrical engineers with wide experience in the operation and maintenance of hydro-electric generating stations, substations, transmission and overhead distribution. Opportunity for promotion to superintendent after satisfactory service. Salary $425.00 per month. Apply to File No. 1309-V.

TECHNICAL ASSISTANT required in Halifax, N.S. Applicants must be graduate engineers with wide mechanical and electrical experience in the construction operation and maintenance of modern steam generating stations. Applications should be forwarded not later than Dec. 15, 1949. Salary $475.00 per month. Apply to File No. 1309-V.

SALES ENGINEER required in Ontario. Preferably applicant with experience in the heating and ventilating field, or alternatively, refrigeration. Age 25-35 years. Mainly Toronto area but some time spent each month in Montreal area. Salary open. Apply to File No. 1310-V.

TOOL AND DIE DESIGNER, wanted by well established Ontario Range Manufacturer, to head tool engineering division. Must have practical experience in operations and tools and materials used in stove and furnace manufacture and the ability to establish modern methods of operational procedures. Apply to File No. 1311-V.

Situations Wanted

ELECTRICAL ENGINEER, S.E.I.C., B.Sc. Alberta 1949. Age 29. Single. Desires employment in electronic field, would consider power field. 4½ years experience R.C.A.F. radar mechanic, 18 months, repair and assembly in radar factory. Available after September 15th. Apply to File No. 137-W.

EXECUTIVE AVAILABLE, M.E.I.C., University graduate Engineering and Administration. Middle forties. Wide experience Administration, planning, manufacturing, sales, engineering, and comptroller functions. Presently senior officer large Canadian company. Apply to File No. 185-W.

GRADUATE, Institution of Mech. Engineers, Ex-Captain REME, B.Sc. Tech. (Manchester), two years works experience, 26, arriving Canada end of November, desires suitable employment on production side. Apply to File No. 189-W.

MECHANICAL ENGINEER, M.E.I.C. P.Eng. (Registered in Ontario and Quebec), age 50. Seeks technical representations, on salary or commission, in Ottawa or Eastern Canada. Specialties, light manufacturing and research projects. Apply to File No. 199-W.

GRADUATE CIVIL ENGINEER, University of Sask. 1949, S.E.I.C. age 25, veteran. Desires employment in hydraulic or structural engineering field. Experience in concrete construction, hydraulic development and general survey work during successive summers. Apply to File No. 203-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., Queen's 1948, age 23, single. One summer of railroad surveying. One summer on government topographical survey. Presently employed as transitman on highway location survey in Yukon. Desire work in hydraulic engineering, with pulp and paper company or in general construction, in Ontario or Quebec. Apply to File No. 204-W.

ELECTRICAL ENGINEERING ASSISTANT, A.M.I.B.E., English, 31 years of age, married, one child, proposes to emigrate Ontario Spring 1950. At present employed by the Air Ministry at London Airport in drawing office. 6 years Royal Air Force, 2 years working on construction of diesel power station. Would prefer position with airfield construction contractors or with public utility company in town or country. Apply to File No. 206-W.

MECHANICAL ENGINEERING GRADUATE, B.E., S.E.I.C., University of Saskatchewan, 1949. Age 23. Single. Desires junior engineering or supervisory position in farm implement field. Diversified experience in operating and maintenance. Interested in development, sales or design. Energetic, reliable, with desire for an opportunity to train for responsible position rather than salary. Ability to make friends and get things done. Available in near future. Foreign or Domestic. Apply to File No. 240-W.

GRADUATE of Engineering and Business, S.E.I.C., Toronto 1949. B.A.Sc. (Honours). Age 24. Some experience in both kraft and fine paper mills. Prefers a position within the paper industry, but will consider any branch of engineering. Available immediately. Apply to File No. 242-W.

CHEMICAL ENGINEER, Jr.E.I.C., P.Eng., B.Sc., MSc. 1947. Age 26, single, free to travel. Three years varied industrial experience in inorganic and organic chemical manufacture. Have development, production, and pilot plant experience. Co-operative, resourceful and adaptable to all phases of the chemical industry. Desires permanent position, requiring initiative, with good future prospects. Apply to File No. 249-W.

GRADUATE CIVIL AND SANITARY ENGINEER, S.E.I.C. Recorded P.Eng. B.Sc. Queen's 1948, M.A.Sc. Toronto 1949; age 25, single; have held the following positions: instrumentman on highway construction; assistant engineer on hydrographic survey; at present, assistant town engineer with experience in design of sewers and watermains, laying of concrete sidewalks, and also in design of reinforced concrete box culverts; seeking employment in a larger centre, preferably with a consulting engineer. Apply to File No. 250-W.

CIVIL ENGINEER AND ARCHITECT. B.Eng., 1943 at McGill. Graduating in architecture at McGill, May of 1950. Junior member E.I.C. Age 28. Married. Ex-R.C.A.F. officer aircrew. Main interest is town planning and municipal work. Would like to discuss a future. Apply to File No. 252-W.

MINING ENGINEER; M.E.I.C., P.Eng. McGill 1940. Married. Age 32, bilingual, with past experience covering engineering in layout, designing, estimating, planning and operating of underground and open pit mines desires suitable change with greater responsibility. Apply to File No. 256-W.

CIVIL ENGINEER, S.E.I.C., B.Sc. (Alberta '48), P.Eng. (Ontario). Age 28, married, veteran, desires position of responsibility with consulting firm or municipal corporation in town planning, municipal engineering, or hydraulic engineering. Design or construction supervision. Prefer location in Western Canada. Presently employed as Chief Draughtsman and staff engineer including design of all municipal projects, etc. One year as reinforced concrete and structural steel designer. Apply to File No. 283-W.

CIVIL ENGINEERING GRADUATE, Jr. E.I.C., P.Eng., professional engineer and estimator with large Montreal construction company seeks sparetime work. Cost or quantity estimates, structural steel or reinforced concrete design, surveying problems, etc. Special opportunity for firms with no estimating department or firms with the occasional overloaded staff. Apply to File No. 286-W.

STRUCTURAL ENGINEER, M.E.I.C., R.P.E., presently employed as Chief Draftsman, Designer and Estimator with company fabricating 4000 tons of structural steel per year desires position of responsibility and authority with larger or more progressive company. Location no object. Apply to File No. 293-W.

CHEMICAL ENGINEERING GRADUATE, S.E.I.C., S.C.I.C., B.Sc. (Acadia '41), B.E. Chemical (N.S. Tech. '49), age 35, married, family. Experience: 3 years business (hardware machinery), 1½ years Chemist in control laboratory (explosives), 2½ years Naval. Ordnance (inspection), 4 months pilot plant installation, 4 months asphalt inspection in oil refinery, one month food processing. Available immediately. Will consider any reasonable offer. Preferable location Eastern Canada (except Quebec) or U.S. Apply to File No. 279-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. Established in Vancouver as Consultant and Mechanical designer of wide experience desires work on plant layout, machinery design, quantity surveying, preparation of complete industrial plans, reports, etc. Apply to File No. 304-W.

CIVIL AND MINING ENGINEERING GRADUATE, S.E.I.C., age 27, desires a part time position in Montreal with a consultant of reinforced concrete and structural steel or of mining engineering. Also interested in city engineering in town planning and in building construction. Will be available evenings, week-ends and some afternoons. Apply to File No. 309-W.

CIVIL ENGINEER, M.E.I.C., B.Sc., P.Eng., age 44, married. Wide experience in municipal engineering, both with contractors and consultants, mainly on water supply and sewerage, also roads and buildings. Now employed by contractor as Chief Engineer of sewer and water department. Available on reasonable notice. Apply to File No. 312-W.

CIVIL ENGINEER, GRADUATE, M.E.I.C., with a wide municipal experience, engineering, administrative, financial. Now employed but desires suitable change. Available on reasonable notice. Apply to File No. 317-W.

MECHANICAL ENGINEER, '48. Age 28. Desires part time work in Montreal, evenings and week-ends. Some experience in electrical and mechanical maintenance. Presently employed in heavy machinery design. Apply to File No. 345-W.

GRADUATE ENGINEER, S.E.I.C. Presently employed, is seeking employment on a part time basis. Has experience in survey and mining, field and office work and also in structural (steel and reinforced concrete) design. Also has a good knowledge of foundation soil mechanics. Apply to File No. 351-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Eng., 1945, age 26, single. Four year varied experience switchgear, distribution systems, maintenance, inspection, costs, etc. Desire position in Montreal area but willing to travel. Apply to File No. 658-W.

FIRE PREVENTION ENGINEER, graduate McGill 1936, M.E.I.C., P.Eng. (Que.) with 13 years experience in fire prevention, safety and administrative work covering a wide variety of industrial operations. Work in production-management or maintenance line preferred. Will locate anywhere in Canada. Apply to File No. 1494-W.

MECHANICAL GRADUATE, M.E.I.C., P.Eng., age 42, with experience in mechanical design and plant maintenance, nine years as an industrial loss prevention engineer, desires permanent connection with senior responsibility, Ontario location preferred. Apply to File No. 1543-W.

GRADUATE ENGINEER, M.E.I.C., 10 years experience, design, construction and maintenance in petroleum industry. Desires permanent position offering scope, hard work and variety. Would prefer a smaller company, a consulting engineer or contractor, or to act as sales and service engineer for an equipment manufacturer. Location Western Canada or Ontario. Apply to File No. 1909-W.

MECHANICAL ENGINEER, M.E.I.C. Age 31, married. 8 years engineer officer R.C.N. including cruiser operation, overseeing new construction, instructing engineering graduates. Assistant superintendent in shipyard. Operation diesel generator stations. Interested in practical construction, operation, maintenance, manufacturing methods. Prefer B.C. or Alberta areas. Apply to File No. 2589-W.

MECHANICAL ENGINEER, M.E.I.C., (mechanical, 20 years experience) visiting now in Britain has time free to act in consultive capacity. Apply to File No. 2642-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill 1946, P.E.Q., Jr.A.S.M.E., single, 25, presently employed. Past experience includes 18 months machine shop practice, in addition to time spent at tool proving, estimating, processing, and tool design. Desires position with a concern where these qualifications can be used to good advantage. Available on short notice. Apply to File No. 2707-W.

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Prof. Eng. of Quebec. Polytechnique, U. of Montreal, 1941. Age 33, married, 2 children. Fluently bilingual. Experience includes maintenance and repairs of machinery and buildings as Plant Engineer in Pulp and Paper industry. Supervision of heavy concrete construction, plant layout, organization and production control, cost analysis, time and motion study, boiler house operation, electrical construction, maintenance, production and distribution. Interested in leading position in the industry located preferably in or near province of Quebec. Available in one month's notice. Apply to File No. 2823-W.

MECHANICAL ENGINEER graduate 1944, Jr.E.I.C., P.Eng., Ont.; experienced in production and material control, industrial engineering design and plant engineering. Past experience in building products, basic steel and foundry and implement manufacturing. Employed, age 29, married. Desires position in progressive organizations. Apply to File No. 2955-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. (Quebec). Large experience in plant maintenance, production planning and machinery design. Good theoretical background. Excellent references from former employers. Seeking a responsible position in Montreal. Available on short notice. Apply to File No. 3045-W.

MECHANICAL GRADUATE, age 24, Jr.E.I.C., P.Eng., Q., Queen's 1947. Two years experience as a maintenance engineer with large Montreal industrial firm. Engaged in general plant and machinery maintenance work, including co-ordination of the work of draughtsmen, machinist and other trades. Evening student in commerce and sociology courses. Navy veteran. Desires maintenance or sales work with another Montreal industrial firm. Apply to File No. 3208-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1947. Age 27. Experience in hydro-electric stations, electrical distribution and electrical repair work. Also experience as instrument man on a survey crew. Desires to obtain a position in power in Western Canada. Apply to File No. 3235-W.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

INTERNAL COMBUSTION TURBINES

Lectures sponsored by the Institution of Mechanical Engineers.

First published as War Emergency Issue No. 41, Institution of Mechanical Engineers Proceedings, Vol. 159, 1948. Reprinted for distribution in the U.S.A. by The American Society of Mechanical Engineers, New York, April, 1949. 268 pp., illus., paper, $2.25.

Reviewed by D. W. Knowles*

This book consists of a series of papers presented before the Institution of Mechanical Engineers, London, by members of the staff of the National Gas Turbine Establishment. The use of gas turbines in non-aircraft applications is stressed, as a previous symposium† covered the development of British aircraft gas turbines. The papers in the group are reviewed individually below.

The Prospects of Land and Marine Gas Turbines

Hayne Constant.

This paper will be of interest to many Canadian engineers. The author concludes that if a suitable regenerative heat exchanger can be developed a wide field of usefulness can be foreseen in marine and locomotive applications, and as a part of stand-by or peak load power generating plants. Unfortunately no mention is made of the possibility of applying gas turbines in such process industries as steel, oxygen, nitric-acid, synthetic rubber, and petroleum products manufacture.

Part-Load Performance of Various Gas-Turbine Engine Schemes

D. H. Mallinson and W. G. E. Lewis.

The authors point out that in many applications, the selection of a gas-turbine engine cycle and the arrangement of the compressor, intercooler, combustor, turbine and regenerator elements is influenced not only by the performance at design point but also by the need of good part-load efficiency and wide operating range. A large number of possible cycles are considered and their usefulness for various applications discussed. On account of the necessity of making arbitrary assumptions respecting the component performance characteristics, the results quoted cannot be considered as accurate quantitatively but show the relative worth of the various schemes considered. One is struck by the great variety of possible plant arrangements available to the gas turbine designer, allowing him considerable scope in selecting a plant cycle to meet special circumstances.

The Fuel Problem in Gas Turbines

Peter Lloyd.

This paper considers the problem of fuel selection for gas turbines and attempts to study the effect of various fuel properties on the combustion process. The discussion is limited to the use of liquid hydro-carbon fuels. No mention is made of the important problem of burning gaseous or solid fuels in gas turbines. This is rather surprising in light of the relative availability of coal and oil in Great Britain and the recent successful experiments on the combustion of coal in gas turbines in the U.S.A.

It is concluded that the important properties affecting gas turbine operation are, viscosity, initial and final boiling point, elementary analysis of the organic constituents and the physical characteristics of the ash.

The paper would make worthwhile reading for anyone interested in the combustion properties of petroleum products.

The Performance of Axial-Flow Turbines

D. G. Ainley.

The fourth paper in the series deals with the performance of the aerofoil-type turbine blading used in gas turbines. The gas flow pattern through the turbine stages is considered and the factors affecting blade efficiency are discussed. Experimental results of tests on various types of turbine blades are presented. A discussion on turbine testing technique concludes the paper. The difference in approach to the design problem adopted by gas turbine and steam turbine designers is well shown.

Heat Flow in the Gas Turbine

A. G. Smith.

In this lecture the method of cooling the blades of high temperature turbines is considered and experimental data bearing on the problem are presented. A short discussion on the advantages of the regenerative type of heat exchanger is given along with some relevant data on heat transfer in laminar flow.

Three-Dimensional-Flow Theories for Axial Compressors and Turbines

A. D. S. Carter.

The nature of the secondary flows taking place in turbine and compressor blade rows is explained. It is shown that these flows not only cause losses in themselves but modify the operating conditions of the individual blade sections to the detriment of the overall performance. The author discusses the various empirical design factors used to take account of secondary flows and indicates that by proper appreciation of the factors involved the methods of improving performance can be easily investigated.

While these papers all deal with specific problems related to the field of gas turbine design the methods used in attacking problems should be of interest to engineers in a much wider field. In fact the whole series is worthwhile reading for those dealing with the design of turbo-machinery, heat transfer apparatus and combustion equipment.

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*Chief Test Engineer, A. V. Roe Canada Ltd., Toronto, Ont.

†Lectures on the Development of the Internal Combustion Turbine. War Emergency Issue No. 12, Institute of Mechanical Engineers, Proceedings, Volume 153, 1945.

LIBRARY REGULATIONS

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SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

A.S.M.E. Mechanical Catalog and Directory, 1950, 39th vol.

American Society of Mechanical Engineers, New York, 1949. 690 pp., illus., cloth.

Acoustic Measurements:

Leo. L. Beranek. New York, Wiley; London, Chapman, 1949. 914 pp., illus., cloth.

Airplane Performance Stability and Control:

Courtland D. Perkins. New York, Wiley; London, Chapman, 1949. 493 pp., illus., cloth.

Alloy Steels, Cast Iron and Non-Ferrous Metals:

F. Johnson. New York, Chemical Publishing Co., 1949. 227 pp., illus., cloth.

Analytical Mechanics of Gears:

Earle Buckingham. New York, Toronto, London, McGraw-Hill, 1949. 546 pp., illus., cloth.

Appareils Electriques Connecteurs et Desconnecteurs:

J. Saint Germain. Paris, Gauthier-Villars, 1949. 419 pp., illus., paper.

Applied Experimental Psychology: Human Factors in Engineering Design:

Alphonse Chapanis, Wendell R. Garner, and Clifford T. Morgan. New York, Wiley; London, Chapman, 1949. 434 pp., illus., cloth.

Business Helper for the Modern Man Operating a Small Business:

Leslie C. Rucker. New York, Rider, 1949. 133 pp., cloth.

Electrical Engineers' Handbook: Electric Power, 4th ed.:

Harold Pender and William A. Del Mar. New York, Wiley; London, Chapman, 1949. Paged in sections, illus., cloth.

Elements of Diesel Engineering:

Orville L. Adams, Sr. New York, Henley, 1949. 367 pp., illus., cloth.

Enroulements Industriels à Courant Continu et à Courants Alternatifs: Théorie et Pratique, 3rd ed.:

Eugene Marec. Paris, Gauthier-Villars, 1949. 296 pp., illus., paper.

Handbook of Chemistry, 7th ed.:

Norbert Adolph Lange and Gordon M. Forker. Sandusky, Ohio, Handbook Publishers, 1949. 1,920 pp., tables, cloth.

Hydro-Electric Engineering:

Geoffrey Gerard. London, Pitman, 1949. 181 pp., illus., cloth.

Induction Heating:

N. R. Stansel. New York, McGraw-Hill, 1949. 212 pp., illus., cloth.

Introduction to Statistical Mechanics:

Ronald W. Gurney. New York, Toronto, McGraw-Hill, 1949. 268 pp., diagrs., cloth.

Maintenance Manual of Electronic Control:

Robert E. Miller. New York, Toronto, McGraw-Hill, 1949. 304 pp., illus., cloth.

Motor-Vehicle Driver: His Nature and Improvement:

Eno Foundation. Saugatuck, Conn., 1949. 165 pp., illus., paper.

Reviews of Petroleum Technology: Vol. 8 (covering 1946):

F. H. Garner, E. B. Evans, and George Sell. London, Institute of Petroleum, 1949. 445 pp., tables, cloth.

Physical Principles of Oil Production:

Morris Muskat. New York, Toronto, McGraw-Hill, 1949. 922 pp., charts, diagrs., cloth.

Plain Concrete:

Edward E. Bauer. New York, Toronto, McGraw-Hill, 1949. 441 pp., illus., cloth.

Power Capacitors:

R. E. Marbury. New York, Toronto, McGraw-Hill, 1949. 205 pp., illus., cloth.

Reinforced Concrete:

A. L. L. Baker. London, Concrete Publications, 1949. 295 pp., illus., cloth. (Concrete series.)

SAE Handbook, 1949 Edition:

Society of Automotive Engineers, N.Y., 1949. 933 pp., charts, diagrs., cloth.

Structure and Properties of Alloys: The Application of Phase Diagrams to the Interpretation and Control of Industrial Alloy Structures, 2nd ed.:

R. M. Brick and Arthur Phillips. New York, Toronto, McGraw-Hill, 1949. 485 pp., illus., cloth.

Yearbook of the Heating and Ventilating Industry:

London, Technitrade Journals Ltd., 1949. 247 pp., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ETC.

American Society for Engineering Education:

Proceedings; Volume 56, 1948-49.

British Standards Institution:

Yearbook; 1949.

Canadian Electrical Association:

Proceedings; 59th Annual Convention, 1949.

Institution of Mechanical Engineers:

General Index to Proceedings, 1931-1940.

U.S. Highway Research Board:

Proceedings; 28th Annual Meeting, 1948.

University of Toronto. Engineering Society:

Transactions and Yearbook, 1949.

TECHNICAL BULLETINS, ETC.

American Society for Engineering Education. Engineering College Research Council:

Review of Current Research and Directory of Member Institutions, 1949.

Canada. Bureau of Mines. Memorandum Series:

No. 104—Silica in Canada, A. R. MacPherson.

Institution of Electrical Engineers. Paper:

Electrical Weighing, H. I. Andrews.

Institution of Mechanical Engineers. Advance Papers:

Engineering Steels Under Combined Cyclic and Static Stresses, H. J. Gough.—Some Developments in Instrumentation for Air-flow Analysis, K. W. Todd.—Ignition Equipment—Development and Lessons, E. A. Watson.—The Influence of Certain Factors on the Performance of a Lancashire Boiler, E. G. Ritchie.

National Research Council:

Review, 1949.

Northeast Coast Institution of Engineers and Shipbuilders. Advance Paper:

Application of Photoelastic Methods to Ship Design Problems, J. A. H. Paffett.

Society of Naval Architects and Marine Engineers. Advance Papers:

No. 1—Design of Propellers, J. G. Hill.—No. 2—Longitudinal Vibrations of Marine Propulsion-Shafting Systems, J. R. Kane.—No. 3—Rivet Slip, Stress Distribution, and the Deflection of Ships' Hulls, E. M. MacCutcheon.—No. 4—Structural Tests on the Passenger Ship S.S. "President Wilson"—Interaction Between Superstructure and Main Hull Girder, John Vasta.—No. 5—Some Case Histories of Shipboard Lubricating Problems During World War II, Captain W. D. Legget, George L. Neely, and Commander J. B. Ritch.—No. 6—Thicknesses of Steam Piping for High-pressure, High-temperature Service, Henry C. E. Meyer.—No. 7—Notes on the Design of Hotel Services for Passenger Ships, E. P. Worthen and W. H. Muller.—No. 8—Structural Design and Details of Longitudinally Framed Tankers, David P. Brown.—No. 9—Investigation of Cargo Distribution in Tank Vessels, Joseph H. McDonald, and Donald F. MacNaught.

Svenska Forskningsinstitutet for Cement Och Betong. Handlingar:

N:R 12—Development of Fluidity and Mobility Meters for Concrete Consistency Tests, Anders G. Eriksson.

University of Washington. Engineering Experiment Station. Bulletins:

No. 115—The Influence of Random Roughness on Flow in Pipes, Charles W. Harris.—No. 116, part 1—Aerodynamic Stability of Suspension Bridges: Investigations Prior to October 1941, F. B. Farquharson.

PAMPHLETS, ETC.

Bibliography of Blackout and Dimout Lighting Practices During World War II: including an Engineering Digest of Defense Lighting:

Special Committee on Wartime Lighting Practices During World War II. New York, Illuminating Engineering Society, n.d.

How the Industrial Designer Can Help You in Your Business:

National Industrial Design Committee. Ottawa, National Gallery, 1949.

Oblique Shear: Extension of the Theory of Complementary Shear:

S. B. Joshi and R. N. Joshi. Bombay, India.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

A.R.R.L. ANTENNA BOOK, 5th ed.:

American Radio Relay League, West Hartford, Conn., 1949. 288 pp., illus., $9\frac{1}{2} \times 6\frac{1}{2}$ in., paper, $1.00 in the United States, its possessions and Canada; $1.25 elsewhere.

Deals largely with the principles of antennae and transmission lines, useful design data, and the development of methods and devices for determining and optimizing the performance of an antenna system. This new edition presents the accumulation of data acquired through the practical experience of the past ten years on the part of both the authors and hundreds of amateurs.

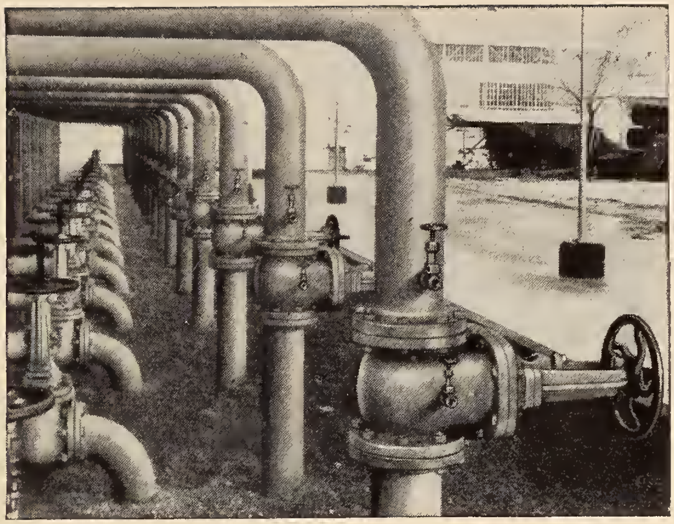
BRITISH STANDARDS

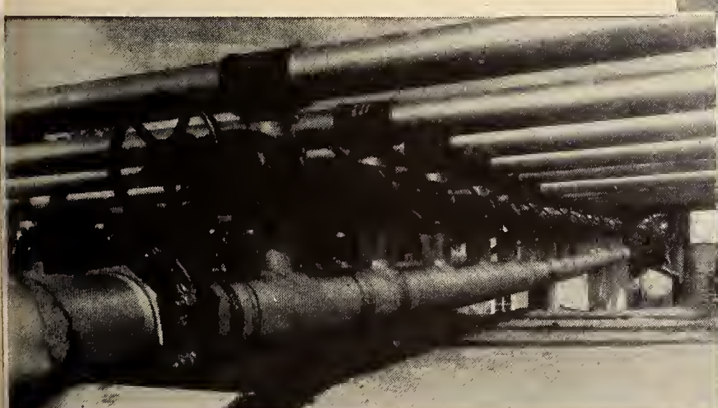
B.S. 1539:1949—Moulded electrical insulating materials for use at high temperatures. *2/-.*

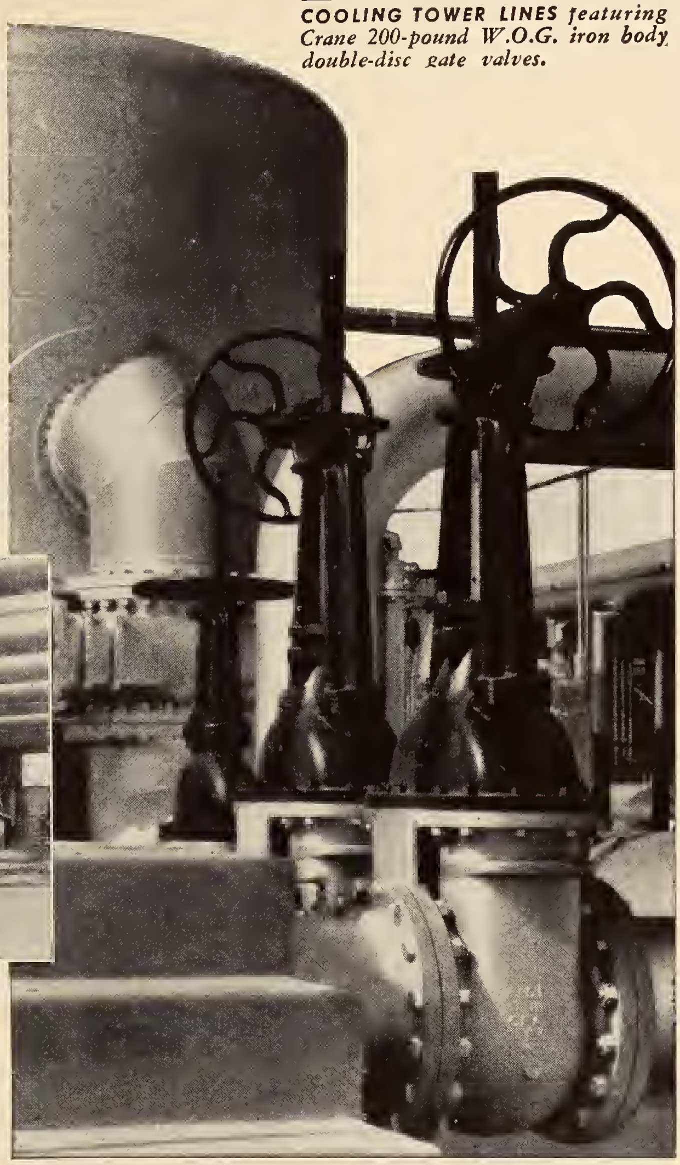
Deals with moulded electrical insulating material for use where temperatures may exceed 180 . Covers arc-resisting. non-ignitable, and self-extinguishing materials.

B.S. 1540:1949—Moulded electrical insulating materials for use at radio frequencies. *2/-.*

Covers moulded electrical insulating materials subjected to alternating electric fields having a frequency greater than 10,000 cycles per second. Deals with fused silica, vitreous materials, ceramic materi-







als for insulators, ceramic materials for dielectrics, rubber-base materials and synthetic resins.

B.S. 1547:1949—Flameproof industrial clothing (materials and design). *2/–.*

Specifies requirements, and a test of materials flameproofed with a deposit of soluble salts. Covers the marking of flameproofed material, the essential points in design of clothing and its maintenance.

B.S. 1551:1949—Capacitors for intrinsically-safe circuits. *2/–.*

Provides a definite standard of construction for capacitors used in the coupling of an intrinsically-safe telephone circuit to the G.P.O. system, and for analagous purposes.

The British Standards Institution has prepared a number of British Standards to form a part of the series of standards for nickel and nickel alloys covering the various forms of wrought materials. The New Standards, available for 2/– each, post free, from the British Standards Institution, Sales Dept., 24-30 Gillingham St., London, S.W.1, are as follows:

1537:1949—Nickel-copper alloy castings for general purposes.

1528-1949—Malleable nickel bars, rods and sections for general purposes.

1529:1949—Nickel-copper alloy bars, rods and sections for general purposes.

1530:1949 — Nickel - chromium - iron alloy bars, rods and sections for general purposes.

1534-1949—Malleable nickel wire for general purposes.

1535:1949—Nickel-copper alloy wire for general purposes.

1536:1949 — Nickel - chromium - iron alloy wire for general purposes.

CHEMISTRY AND TECHNOLOGY OF ENZYMES:

Henry Tauber. New York, Wiley; London, Chapman, 1949. 550 pp., illus., 9¼ x 6 in., cloth, $7.50.

This is an expansion of the author's recent book, Enzyme Technology. The new book discusses almost all the known enzymes, and describes numerous industrially important findings. An up-to-date review of enzyme chemistry is presented, in addition to the production of industrially important organic compounds by fermentation, and the microbiological procedures for the quantitative determination of vitamins and amino acids.

FBI REGISTER OF BRITISH MANUFACTURERS, 1948–49, 21st ed.:

Federation of British Industries. London, Kelly's Directories Ltd., 1949. 752 pp., 9½ x 7¼ in., cloth, 30/–.

This book, published annually, contains the names and addresses of nearly six thousand firms, listed under headings covering more than five thousand products, and including only British firms. An alphabetical list supplies brands and trade names, indicating the products and manufacturers they represent. A section is devoted to trade-marks arranged alphabetically under subject headings.

FLOOD OF 1948 IN BRITISH COLUMBIA:

C. E. Webb, M.E.I.C. Vancouver, Dominion Water & Power Bureau, 1949. 41 pp., maps, diagrs., charts, 13 x 8 in., paper.

This report covers one of the most disastrous floods in the history of British Columbia, and contains a general description of the flood, the damage caused by it, and presents, in table form, the hydrometric data.

INTRODUCTION TO CHEMICAL SCIENCE, 2nd ed.:

W. H. Hatcher. New York, Wiley; London, Chapman, 1949. 449 pp., diagrs., 8¾ x 5½ in., cloth, $4.00.

This edition deals with inorganic, organic, food and industrial chemistry, and is intended to form a continuous study for non-specialists. The treatment is in the main historical, and is not a survey of the physical and biological sciences, and the correlation with the other Sciences is stressed only in so far as it tends to develop a scientific mode of thought and a solid acquaintance with the development of chemistry in its commoner phases.

LAMPES A ECLAIRS LUMIERE BLANCHE ET LEURS APPLICATIONS:

Marcel Laporte. Paris, Gauthier-Villars, 1949. 85 pp., illus., 10 x 6½ in., paper.

This book deals with the feeding of flash tubes and with their scientific or technical applications. In two distinct chapters, the author also deals with the electrical and luminous characteristics of condenser discharges through gas tubes.

MEDICAL X-RAY PROTECTION UP TO TWO MILLION VOLTS:

U.S. National Bureau of Standards. Washington, 1949. 43 pp., tables, 8¾ x 5 in., paper, 15c in U.S. exchange, plus 5c for mailing costs. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

This publication sets forth recommended standards of safety for the installation and use of high-voltage X-ray equipment. Rules are given for working conditions, survey and inspection of installation, planning an X-ray installation, structural details of protective barriers, and specific types of installations.

NATIONALLY RECOGNIZED STANDARDS IN STATE LAWS AND LOCAL ORDINANCES; a Presentation of the Problem and Possible Solutions:

American Standards Association. New York, American Standards Association, 1949. 43 pp., 11 x 8½ in., paper, $1.00.

This report is a symposium of articles, the main ones being entitled "Economic effects of lack of uniformity of acceptance of nationally recognized codes and standards", "Effects on the general public, on public and private building agencies, and on the home owner of lack of uniformity of acceptance of nationally recognized codes and standards", "Municipal adoption of codes by reference", and "The constitutional and legal problems surrounding the use of national codes and standards by states and municipalities".

ON THE THEORY OF STOCHASTIC PROCESSES AND THEIR APPLICATION TO THE THEORY OF COSMIC RADIATION:

Niels Arley. New York, Wiley, 1948. 240 pp., diagrs., 9 x 6 in., cloth, $5.00.

Material is divided into two separate parts, the first dealing with purely mathematical problems; the second with physics. The purpose of this book is to investigate in further detail the so-called fluctuation problem in the theory of cosmic radiation.

RAYONNEMENT PHOTOMETRIE ET ECLAIRAGE:

Merry Cohu. Paris, Gauthier-Villars, 1949. 398 pp., illus., 10 x 6½ in., paper, 1700 fr.

The author makes a survey of light, ultra-violet, infra-red, X-rays, and radio waves, considering these as subdivisions of the realm of electro-magnetic radiations. However, the major part of the book deals with measurement, sources and lighting power of visible light, culminating in a thorough study of the lighting of dwellings, roads and fields.

REGLES D'UTILISATION DES RONDS CRENELES ET LISSES POUR BETON ARME DE LIMITE D'ELASTICITE SUPERIEURE OU EGALE A 40 kg/mm²:

Institut Technique du Batiment et des Travaux Publics, Paris, 1948. 59 pp., illus., 9 x 5½ in., paper, 300 fr.

This booklet deals with the rules of utilization of curved structural steel bars. The first part considers steel bars that have been notched for better concrete adherence, while the second deals with smooth curved bars.

SELLING TECHNICAL BOOKS AT RETAIL:

Margaret Specht. New York, American Book Publishers Council, 1949. 22 pp., illus., 9 x 6 in., paper, 50c.

This booklet gives information on the market for technical books, on stocking a technical book section, on techniques for selling technical books and on training the staff.

STATIQUE APPLIQUEE ET RESISTANCE DES MATERIAUX, VOL. 1— Systèmes Isostatiques; Calcul des Efforts; Déformations Elastiques; Problèmes de Stabilité; Cables:

F. Stussi. Paris, Dunod, 1949. 338 pp., illus., 10 x 6½ in., paper, 1880 fr.

Being the first volume of a series of lectures on applied statics and resistance of materials, this textbook contains a development of the lectures given to the second year students in civil engineering at Zurich. It deals with the calculation of isostatic systems, of stresses and elastic deformations, and contains an introduction to stability problems and an excerpt of the static of cables.

STRUCTURE OF MATTER:

Francis Owen Rice and Edward Triller. New York, Wiley; London, Chapman, 1949. 361 pp., diagrs., 9¼ x 6 in., cloth, $5.00.

This book shows the scope of the phenomena that can be explained by quantum mechanics, emphasizing the qualitative and the practical consequences of atomic theory. It is not intended as a work of reference, but provides a broad informal review of the quantum theory and its application to the structure of matter.

TRAITE DE MECANIQUE GENERALE ET APPLIQUE; TOME 1:

A Tenot and P. Chillon. Paris, Dunod, 1949. 499 pp., illus., 10 x 6½ in., paper, 1440 fr.

This treatise of general and applied mechanics states principles, and demonstrates fundamental theorems, giving their possibilities of interpretation and application. The physical aspect of mechanic phenomena is brought up in the first part of the book, while the second part of the treatise deals with the study of rational mechanics by the vectorial method.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

ADVANCED CALCULUS FOR ENGINEERS:

F. B. Hildebrand. Prentice-Hall, New York, 1949. 594 pp., diagrs., tables, 8½ x 5½ in., cloth, $8.00.

This book is an integrated presentation of special topics and useful methods of calculus found to be essential to engineers and physicists. The first five chapters are concerned with ordinary differential equations; succeeding chapters deal with ideas and tools of vector analysis, introduce and apply the basic concepts of partial differential equations, and discuss the theory of a complex variable. Problems with answers are included.

BIBLIOGRAPHY ON SPRAYS:

Compiled by K. J. DeJuhasz. Published by Texas Company, Refining Dept., Technical and Research Division, 135 East 42nd St., New York; McColl-Frontenac Oil Co. Ltd., Montreal, August, 1948. 98 pp., 10¾ x 8½ in., paper, gratis.

This comprehensive annotated list of over 300 articles and books is an expansion of an earlier listing, and is intended as an aid to the investigation of fuel injection problems met in connection with Diesel engines, gas turbines, and jet engines. It also contains certain items on industrial sprays, dusts, powders, etc. The arrangement is alphabetical by author with a classified subject index.

CONSTRUCTIVE USES OF ATOMIC ENERGY:

S. K. Allison and others, edited by S. C. Rothmann. Harper & Brothers, New York, 1949. 258 pp., illus., diagrs., charts, tables, 8¼ x 5½ in., cloth, $3.00.

This volume brings together fourteen articles by specialists describing the current uses of atomic energy in the fields of industrial power, chemistry, metallurgy, aviation, ceramics, soil-fertilizer research, biology and medicine, and pointing out the possibilities of future development. An appendix contains a glossary, a classified bibliography, and a chronological list of significant dates.

CONVEYORS AND RELATED EQUIPMENT:

W. G. Hudson. 2 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 468 pp., illus., diagrs., charts, tables, 9¼ x 6 in., leather, $7.00.

This comprehensive treatment of the science of handling materials describes the application of a wide variety of equipment and analyses the several kinds from the viewpoint of effectiveness. It provides a guide to the factors which must be considered when buying, equipping, operating and maintaining conveyors and related devices. The new edition contains an extended discussion of pneumatic conveying.

DIFFERENTIAL EQUATIONS:

H. W. Raddick. 2 ed. John Wiley & Sons, New York; Chapman & Hall, Limited, London, 1949. 288 pp., diagrs., tables, 8½ x 5½ in., cloth, $3.00.

This book deals with methods of solving ordinary differential equations and with related problems in applied mathematics, stressing the importance of the physical units involved. Changes in this second edition inclued a new chapter on the linear equation of the second order and additional material on hyperbolic functions, systems of curves, and vibratory motion.

ELEMENTS OF STRENGTH OF MATERIALS:

S. Timoshenko and G. H. MacCullough. 3 ed. D. Van Nostrand Company, New York, Toronto, London, 1949. 426 pp., illus., diagrs., charts, tables, 9¼ x 6 in., leather, $5.00 (in Canada).

Based on the author's work of the same title published in 1930, this book is considerably abridged and is designed for undergraduate courses in elementary strength of materials. It covers stresses and strains, moments and deflections, and methods for testing the mechanical properties of materials. New problems are included, with partial or complete answers; standard symbols and abbreviations are used; and some topics have been added, such as plane strain, the use of strain rosettes, etc.

ETANCHEITE DES TOITURES-TERRASSES — PROCEDES MULTICOUCHES:

L'Institut Technique du Batiment et des Travaux Publics, 28 Boulevard Raspail, Paris VII^e, 1949. 35 pp., diagrs., tables, 10½ x 8¼ in., 250 frs.

This officially authorized publication presents recommended methods for the construction of flat roofs by multiple-layer methods, with particular attention to water-tightness. Structural and covering materials, joints, drainage equipment, and supporting structures are described and illustrated.

HYDROLOGY:

C. O. Wisler and E. F. Brater. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 419 pp., illus., diagrs., charts, maps, tables, 8¾ x 5¾ in., cloth, $6.00.

Intended for use as a college text, this book presents fundamental principles. The main topic covered is stream flow, its fluctuations and the causes thereof. The distribution graph, the unit hydrograph, and the theory of infiltration capacity are included. References are given as footnotes, and there are many diagrams and charts.

INTRODUCTION DES RADIOCHEMISTRY:

G. Friedlander and J. W. Kennedy. John Wiley & Sons, New York; Chapman & Hall, Limited, London, 1949. 412 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

Presupposing no previous knowledge of nuclear physics, this volume is prepared as a textbook for an introductory course in the broad field of radiochemistry at the graduate or senior undergraduate level. The first five chapters provide historical and basic background material. The remaining chapters consider a quantitative treatment of radioactive decay processes, the various types of radioactive disintegration, a statistical treatment of radioactivity data and the applications of radioactivity to chemistry.

MANAGEMENT PLANNING AND CONTROL:

B. E. Goetz. McGraw-Hill Book Company, New York, Toronto, London, 1949. 294 pp., charts, tables, 9¼ x 6 in., cloth, $4.10 (in Canada).

This text develops a theory and practice of accounting from managerial needs for data to aid in solving problems of planning and controlling enterprise operations. The theory and technique presented are based on the use of incremental costs and revenues, and of opportunity costs. Practical examples of the application of the principles discussed are included, and a list of related reading material accompanies each chapter.

REFRIGERATING DATA BOOK, 6th Edition:

American Society of Refrigerating Engineers, 40 West 40th St., New York, 1949. 692 pp., plus "Refrigeration Classified" Section, 248 pp., illus., diagrs., charts, tables, 9¼ x 6¼ in., fabrikoid, $7.00 in U.S.A.; $7.50 elsewhere.

The new edition of this well-known work covers basic data, fundamental principles and practices of refrigeration. Theory and components, industrial, domestic and commercial systems, and air conditioning are treated in separate sections. There is much tabular material. A glossary, codes and specifications are included. A large section is devoted to classified advertisements of materials, components and accessories.

STRUCTURAL DESIGN IN WOOD:

C. Mackintosh. School of Applied Engineering, 233 So. Broadway, Los Angeles, Calif., 1946. 100 pp., diagrs., charts, tables, 10¾ x 8½ in., paper, $2.50.

This book contains a series of lectures on the effect of the special properties of timber upon the design of structures. Methods of designing structures together with their joints are considered with the object of obtaining maximum strength, safety and durability. The woods dealt with are Douglas Fir, Redwood, and Southern Yellow Pine. Numerous diagrams, references and questions are included.

TEMPERATURE AND HUMAN LIFE:

C. E. A. Winslow and L. P. Herrington. Princeton University Press, Princeton, New Jersey; Toronto, S. J. Reginald Saunders, 1949. 272 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $4.50 (in Canada).

This book analyses the effect of heat and humidity on human life and the effectiveness of artificial controls. It summarizes basic background knowledge dealing with the production of heat in the body and presents the results of experiments on the basic problems of thermal interchange between the body and environment. The fundamental objectives of air conditioning are considered, and heating systems are discussed.

TOOL ENGINEERS HANDBOOK:

Edited by F. W. Wilson. McGraw-Hill Book Co., New York, Toronto, London, 1949. 2,070 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $19.50 (in Canada).

Of interest to all associated with the mechanical manufacturing industries, this reference book covers all phases of planning, control, design, tooling and other operations involved in the processing of finished products. It is based, wherever possible, on published governmental, associational and industrial company standards, and contains many definitions, symbols, equations, tables and charts, in addition to methods, practices and procedures. The more than 2,000 pages of basic factual data are divided into separate chapters for the major types of tools and processes.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Belt Grinder. — A belt grinder, which can be set at any angle, has been announced by the H. L. Ramsay & Co., La Grange, Ill. The grinder is mounted on an axis that centres at the motor shaft and with one turn of a clamp nut, the abrasive belt can be set at any angle. Complete details may be obtained from the Company. The street address is 636 South 10th Avenue, La Grange, Ill.

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Jet Airliner.—The DeHavilland Comet, claimed to be the world's first jet airliner, recently flew from the Shetland Islands to its base at Hatfield, a distance of 590 miles, in one hour. The flight was made at heights of between 35 and 40 thousand feet. The flight was the last lap of a routine test flight of five hours and 35 minutes.

•

Selenium Rectifiers. — The International Rectifier Corporation, 6809 South Victoria Avenue, Los Angeles 43, announces the development of a new line of high voltage selenium miniature rectifiers for electronic applications requiring the conversion of a-c to d-c. These rectifiers consist of six individually tested and matched cells connected in a half wave circuit and rated at a maximum peak inverse voltage of 380 volts. The current ratings available are: 75 ma., 100 ma., 150 ma., 200 ma., 250 ma., 300 ma., and 350 ma. Address requests for further information to the Company at the address given above.

•

New Glass Works.—Pilkington Brothers Ltd., who have been in the glass industry since 1826, are resuming the manufacture of sheet glass in Canada to meet the present increased requirements in this country. A site of about 33 acres for the new works has been obtained in Toronto on Danforth Road, south of Birchmount Avenue. On completion the plant, which will adjoin a spur of the Canadian National Railways, will have about 1½ miles of railway sidings service roads and side railways and when in full production, it is estimated that employment will be available for about 300 men. A. W. Robertson and Company Limited are the contractors for this $3,000,000 project. Pilkingtons already have works at Leaside, Ontario, where mirrors, and thermopane insulating window units are manufactured.

•

Canada-U.K. Trade.—A new "Businessmen's Committee" has been set up to study Anglo-Canadian trade from the businessman's point of view. Several United Kingdom organizations have joined with the Canadian Chamber of Commerce to form the new committee which will meet twice a year, once in each country. The next meeting will be in London at the end of this year or early in 1950. The committee will study problems of internal and external trade affecting both countries, such as exchange difficulties, multilateral trading, etc. Suggestions are to be considered "at the business level" and the prime purpose will be to exchange ideas and views. If circumstances demand, the committee will issue information to correct misconceptions about mutual trading policies and it will make recommendations to one or both of the governments concerned.

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Peat As Fuel.—Britain has just set up a special committee to advise on the utilization and development of peat as a fuel for burning in gas turbines.

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Heating Test Lab.—Northern Electric Company Ltd. has set up an Industrial Heating Test Laboratory in Toronto.

The test centre is under the charge of Allan G. Smith and it will be used to test materials sent in by manufacturers and by the Company's sales personnel. The tests will enable the Company to give information as to whether infra-red heating will solve production problems and recommendations will be made as to the type of infra-red installations required for specific purposes.

•

Acetylene Cutter. — Canadian Liquid Air Company Limited, 1111 Beaver Hall Hill, Montreal, announces the new "Airco No. 3 Monograph", a portable precision oxy-acetylene shape cutting machine.

The Monograph for its cutting range is the lowest priced machine of its type on the market. It is "45% lower in price than anything previously offered and brings machine gas cutting within reach of thousands of shops which up until now have been unable to handle their own shape cutting".

The new machine will cut steel up to 8" in thickness, in any shape within a 56" x 32" area, at speeds ranging from 3" to 30" per minute. The length of the cutting area can be extended by adding tubular rail extensions. The machine will also handle straight line, circle and bevel cutting jobs with a high degree of accuracy. It weighs only 110 lbs.—the tubular rail an additional 35 lbs.—making a portable machine that can easily be transported from shop to shop or to the specific job. The entire unit is packed in a carrying case and can be stored in a 7' x 1½' space. Full information may be obtained from any branch of the Company.

•

British Fair.—For the first time in its 29 years' history, exhibits at the British Industries Fair will cover more than one million square feet of stand space. Overseas visitors are being advised to book accommodation in London and Birmingham as early as possible because the opening of the Fair will coincide with the opening of the tourist season.

•

U.K. Car Sales. — Early in November, the Nuffield Organization, England, announced that Canadian distributors had, within a few days, placed orders for Morris, Riley and MG cars to a value of $7,700,000.

•

Transformers.—Ferranti Electric Limited, Mount Denis, Toronto 15, announce that they are now able to supply certain types of transformers from stock. On receipt of request, stock lists will be forwarded to *Journal* readers from time to time.

•

Prefabricated Concrete. — Billner Vacuum Concrete, S.A., of Philadelphia, Pa., have announced that they will supervise the construction in Cairo, Egypt, of the first multi-story apartment house structure ever to be built entirely of prefabricated concrete.

•

Canada's Economy. — Speaking before the American Society of Tool Engineers in Montreal on October 29th, the Right Honourable C. D. Howe said "Ours is a healthy, prosperous, well-balanced and, in fact, a booming economy. Our situation compares favourably with that of any other country in the world. In the short period of the last decade, we have tripled our production in money terms and doubled it in real terms. Canadian labour income has tripled; Canadian farm income has tripled; Canadian external trade has about quadrupled in value and doubled in volume. In short, Canada has never been in a better position to face whatever adjustments may be necessary in our economic life. That adjustments will be necessary, following the abnormal conditions of the last decade, should be obvious to all. The striking point is the extent to which these adjustments already have been made, and that, during a period of adjustment, Canada has maintained a higher level of investment, production, employment, and real standard of living than ever before."

"No Accident" Award. — The bronze plaque of the Industrial Accident Prevention Associations of Ontario was awarded to the six hundred employees of British American Oil's Central Region (Ontario) wholesale marketing department in recognition of the completion of a million man hours continuous operation without a single lost-time injury. This is a new safety record for the wholesale marketing branch of the petroleum industry in Canada.

Gasoline Motors. — Hercules Motors Corporation, Canton, Ohio, announces the addition of three new 4 cylinder gasoline power units to its range of products. The new units are known as models JX4E, JX4C and JX4D. Details may be obtained from the manufacturer.

Enamelling Aluminum. — After six years of testing, vitreous-enamelling of aluminium in a wide range of colours is now a reality. The process can be used for sanitary ware, washing machine tubs, agitators, architectural tile, outdoor furniture, many other products where a vitreous-enamel finish is desired in combination with aluminum.

The enamel was developed by the electrochemical department of E. I. du Pont de Nemours & Company in the United States. It is applied in the same type of furnace used for the porcelain-enamelling of steel, but furnace temperatures for aluminium are several hundred degrees lower.

Canada's Exports. — Speaking before the delegates at the twenty-second general conference Pacific Northwest Trade Association at Spokane, Washington, on November 15th, W. M. MacKenzie, deputy minister of trade and commerce, said "Every country can display a list of surpluses and deficits, but perhaps in no other country would both sides of the balance sheet contain such basically important commodities in such volume. Because of the specialization of Canadian production our welfare is vitally dependent on the existence of an international system conducive to a large volume of international trade. Our heavy dependence on a relatively few staple exports makes our total exports vulnerable to wide fluctuations from time to time. In 1948 our total exports of domestic products reached 3,075 million dollars, an amount greater than the total exports of the United States in the year 1938, and yet less than a dozen items accounted for that immense total. Four items alone—newsprint, woodpulp, wheat and lumber—made up more than one-third.

B.C. Power Purchase. — Properties of the Lake Cowichan Electric Company have been purchased by the B.C. Power Commission and have been incorporated in the Vancouver Island system of the Company. Purchase of the system was recently authorized by the Government at a figure of $68,000. It adds 428 customers to the 19,000 already served by the Commission on the Island.

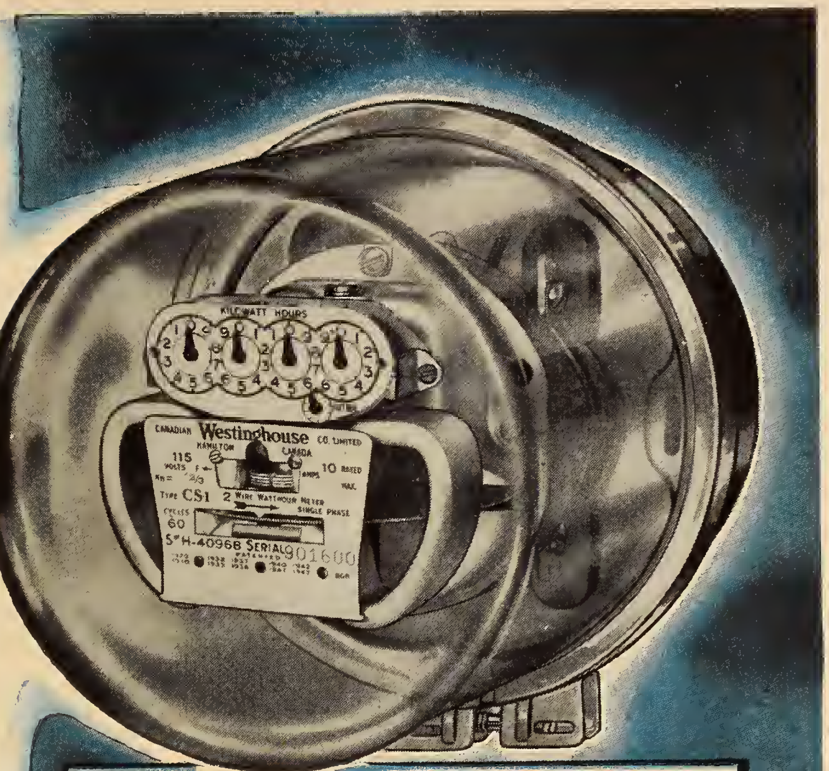
Temporary Windows.—A test of Cel-O-Glass as temporary windows in the new Bank of Canada building in Montreal's downtown financial district showed that a 50 per cent saving in cost of materials and a 100 per cent boost in efficiency, resulted from the use of this cellulose acetate coated wire mesh.

The contractors, who formerly boarded up windows for weather protection while completing interior construction, introduced the plastic coated wire mesh primarily because of its economy, appearance and ease of installation.

U.K. Exports.—British exports to Canada in October were about £6.4 million pounds ($19.6 million dollars) compared with £5.3 million pounds ($16.3 million dollars) in September.

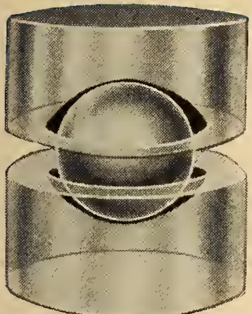
China Clay.—Hundreds of men are now working 12 hours a day to meet a sudden demand for Cornish (England) china clay. Orders from all over the

(Continued on page 866)



Secret of

LONG LIFE



- Two jewels, "Chromsteel" ball, non-corrosive, no lubrication required. Negligible wear.
- "Chromsteel" top bearing pin.
- *Spur pinion* for driving register milled directly on shaft; gives lowest friction.
- 30-rpm (240 volts) full-load speed saves testing time.
- No adjustments required for endplay and centering of disc in air gaps.
- *Disc* accurately and permanently located on shaft.

AN IMPORTANT factor contributing to lower cost metering is the lifetime Ball and Double Jewel bearing.

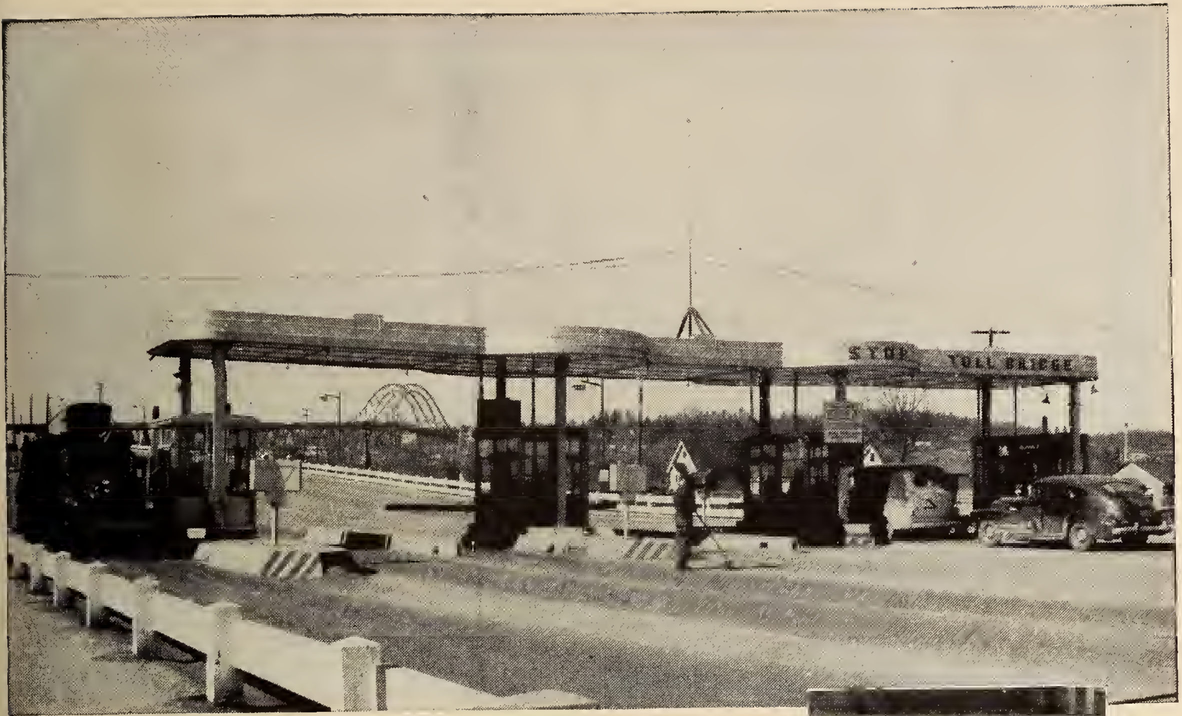
Introduced by Westinghouse way back in 1902, eight years after the first practical Watthour Meter was invented by Westinghouse, it was not until 1939 that other meter manufacturers took this feature seriously.

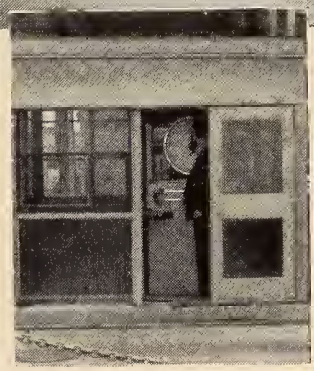
Meanwhile, in addition to the much longer experience with this bearing, Westinghouse has records of continuous trouble-free service, decade upon decade, with installations by the thousands.

That's the kind of economy Utilities want! And, when you get sustained accuracy as well, you have real metering value. Write for Booklet 2247. Canadian Westinghouse Company Limited, Hamilton, Ontario.

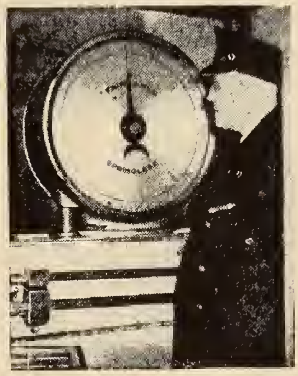
Westinghouse WATTHOUR METERS

Built for Unfailing Performance!





FAIRBANKS-MORSE
SCALES
DO MAJOR JOB
ON FAMED **PATULLO BRIDGE**



Gateway to the main highway to the U.S. and to the Trans-Canada Highway, the Patullo Bridge at New Westminster B.C., is a vital link in national and international traffic.

To weigh all heavy vehicles on this important span, the Provincial Government installed two Fairbanks-Morse 30-ton capacity type "S" motor truck scales equipped with F-M cabinet dials and F-M Printomatics which, at the touch of a button, record the weights indicated on the dial.

These scales, in constant use 24 hours a day, weigh some 100,000 vehicles a month; bridge attendants find them easy to use, fast, accurate and trouble-free.

The B-C Government later purchased 10 more F-M type "S" motor truck scales of 50-ton capacity — a significant indication of the performance and economy of scales made by Fairbanks-Morse.

The CANADIAN
Fairbanks-Morse
COMPANY-*Limited*

(*Continued from page 862*)

world are being received. In one week 30,000 tons of clay were loaded and the greatest urgency is in shipments to Canada. The china clay goes into the making of paper, textiles, pottery, cosmetics and other commodities.

•

Nickel Sales Up.—C. E. Macdonald, manager of Canadian sales, the International Nickel Co. of Canada Ltd., stated on November 10th: "In the past year consumption of primary nickel in Canada has increased almost 10%. There had been a 35% jump in the use of nickel for plating purposes. In the pulp and paper field alone, use of nickel alloys increased 24% in the past year". Mr. Macdonald referred to the use of nickel alloys in jet propulsion motors and praise was given to Canadian aircraft engineers for the pioneer work they are doing in connection with jet propulsion engines.

•

N.S. Roads.—Nova Scotia's road paving programme for 1950 calls for the paving of 133.5 miles of highway. The roads to be paved are located in many parts of the province and in each case the specifications call for completion of grading and other work preliminary to the laying of bituminous surface.

•

New Shovel.—Production of a new 2-yard power shovel—the 51-B is announced by Bucyrus-Erie Company, South Milwaukee, Wisconsin. Convertible in the field for crane, dragline, clamshell or shovel service, the 51-B will be extremely useful to general contractors and mine and quarry operators needing an all-purpose machine. Complete details may be obtained from the Bucyrus-Erie Company, South Milwaukee, Wisconsin.

•

U.K. Machine Tool Exhibit.—"Arrangements have been completed for an all-out effort to redirect a substantial proportion of British machine tool and scientific instrument exports to the dollar market, spearheaded by a mammoth exhibit at the 1950 Canadian International Trade Fair," said Sir Holland Goddard, a prominent U.K. industrialist. Sir Holland heads the British mission which has been in Canada finalizing a multitude of details involved in what amounts to a major shift in trade patterns.

"One of the chief hurdles," he said, "was to reconcile our established production methods and Canadian inspection practices with the Canadian Standards Association in order that products may be cleared without difficulty for the Canadian market. Adjustments have had to be made, and will be made, to obviate delays in inspection and delivery, and to ensure that our machines can be integrated smoothly into the overall operation of Canadian plants. These and other details had to be cleared up before we could proceed with certainty on our ambitious plans to start off our Canadian merchandising campaign at the Trade Fair in Toronto next year."

•

Diesel Locomotives.—Since the first standardized, Canadian-built Diesel-electric locomotive came off the production line in May, 1948, scores of others have been placed in service throughout Canada.

They are the products of three important Canadian firms, each the largest in its respective field, who combined their resources to answer all requirements of the Canadian railways for Canadian-made Diesel-electric locomotives. These three Canadian firms are Montreal Locomotive Works Limited, Canadian General Electric Company Ltd., and Dominion Engineering Works Ltd.

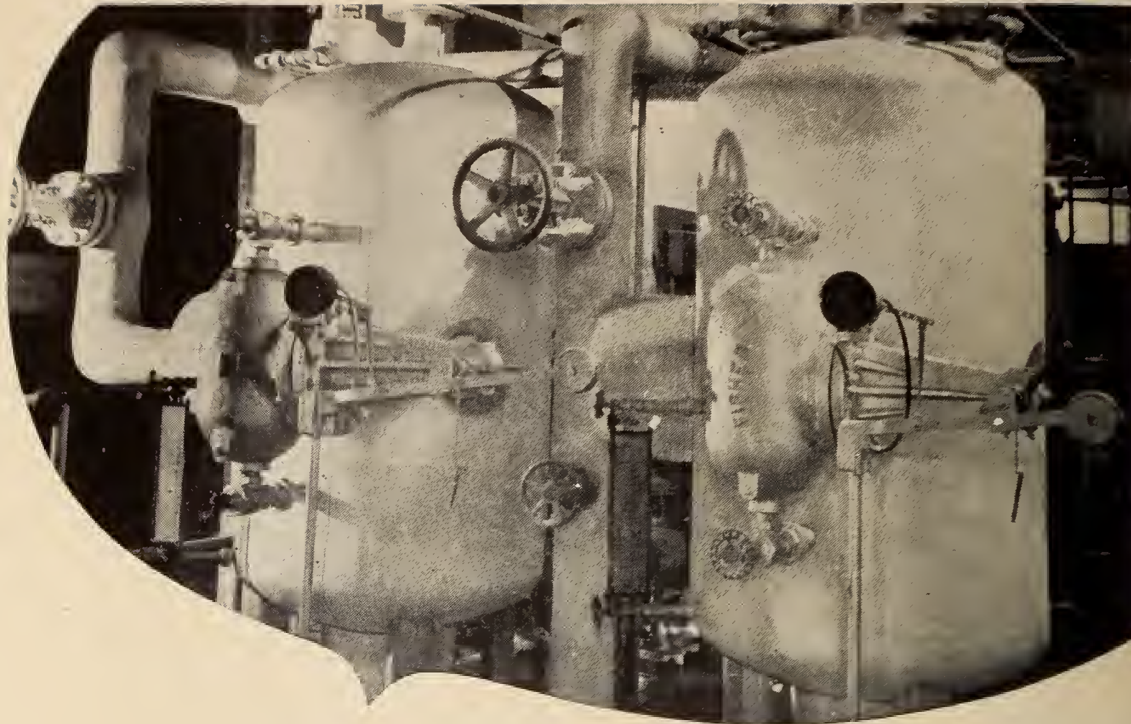
Over $15,000,000 capital is already employed in this established Diesel-electric locomotive industry and a half million square feet of plant facilities are devoted to production. This new industry is providing steady employment to thousands of Canadian workers, not only those directly employed, but many others who work for Canadian suppliers.

•

U.K. Steel Output.—British iron and steel production achieved a record in October of this year with production at an annual rate of 15.9 million tons.

(*Continued on page 870*)


BETHLEHEM
STEEL

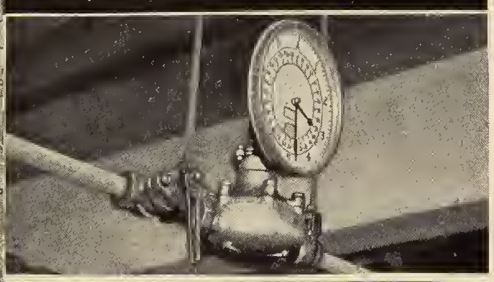


Easiest and Surest Way to Keep Track of Liquids

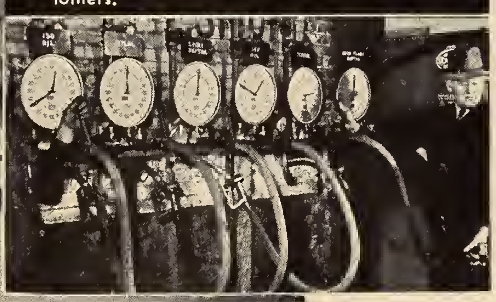
NEPTUNE METERS

IN BATCH MIXING, accurate Neptune meters give choice of manual or automatic operation. Here spirits, water, and liquid sugar are automatically batched into mixing tank.

IN PROCESS CONTROL: For example, this meter measures liquid soap into washing process, saves soap and reduces rinsing time. Use meters also to check consumption rates.



FOR INVENTORY CONTROL, dispensing, receivals, etc., Neptune meters offer the perfect answer. Below six different solvents are being metered into containers.



With demand for closer control pointing to positive displacement meters as the *only* accurate, dependable way to measure liquids, Neptune meters are already "proving out" with 100 different liquids. Photos at left show metering of 10 of these, including liquid soap, liquid sugar, water, acetone and corn syrup.

At a glance, Neptune meters tell daily or hourly consumption, interdepartmental demand, etc.—by volume or in terms of weight. In batch mixing, one type of Trident meter (the Auto-Stop) delivers preset quantity of liquid to mixing tank or kettle, then shuts off automatically.

To take the guess work out of inventory control, meter liquids delivered to your plant, liquids sent to storage, and liquids consumed—even liquid products packaged or dispensed—and accurate inventory figures will always be right in front of you.

Neptune's greater accuracy and longer life are the result of 56 years of experience with 10,000,000 meters. They're simpler, cleaner, precision built. Many types available for any liquids where sanitary or corrosion factors permit composition bronze. Sizes from 5/8 to 6 in., for up to 600 gpm. Pressures 125 or 250 psi.

Write Neptune engineers for help with any of your liquid measuring problems. Better still—why not ask for a complete plant survey at no obligation.

NEPTUNE *liquid* METERS

NEPTUNE METERS LIMITED

Head Office and Factory: TORONTO 14, ONT.

HALIFAX Neptune Meters Limited 11 Hollis St.	**MONTREAL** L. L. Roquet 4077 St. Denis St.	**WINNIPEG** Walsh & Charles Ltd. 206 Tribune Bldg.
CALGARY Neptune Meters Ltd. 4202 MacLeod Trail	**VANCOUVER** John Davidson 505 W. First Ave.	**SAINT JOHN, N.B.** G. S. Dearborn 93 Pr. William St.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Galvanic Corrosion in Oil.—Copies of an article "Galvanic Corrosion in Oil and Gas Well Fluids" by F. L. LaQue, past president of the National Association of Corrosion Engineers, may be obtained from the International Nickel Company of Canada Limited, 25 King Street West, Toronto. Ask for JT-647.

•

"Ni-Hard". — "Engineering Properties and Applications of Ni-Hard" is the title of a new booklet available through the International Nickel Company of Canada Limited, 25 King Street West, Toronto. Ask for this publication by name.

•

Bit Grinding Jig.—A grinding jig for dressing and servicing Kennametal cemented carbide-tipped mining machine bits is now being manufactured by Kennametal Inc., Latrobe, Pa. The jig can be mounted under any standard double-end grinding machine, and mechanically sets and controls the grinding angles. The jig is described in bulletin No. M-106.

•

Waste Screen. — Link Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto 8, announces the development and manufacture of a new screen for removing trash and large solids from water and sewage. The primary elements of the screen are a permanently supported rack of vertical steel screen bars and a power operated screen-bar-cleaning mechanism employing two endless parallel strands of chain between which are fastened two or more steel rakes at evenly spaced intervals. Advantages claimed are: Minimum floor space required; jamming and clogging is practically eliminated; rakes start upward from lowest portion of channel; power consumption and wear are low; chain tension is easily maintained; ample overload protection.

This new product is described in folder No. 2327. Copies will be forwarded on request.

•

Cleaning & Finishing.—"Copper Shot for Blast Cleaning and Finishing Non-Ferrous Metal Parts" is the name of a new bulletin now available from American Wheelabrator and Equipment Corp., 555 South Byrkit Street, Mish Indiana.

Described in the bulletin are t vantages of copper shot — a m only recently introduced to indus in cleaning and finishing brass and non-ferrous castings. Ask for b No. 69.

•

Draughting Grid.—W. Heffer & Ltd., Sidney Street, Cambridge, Mass., have introduced a new draughting unit, known as the "Tracergrid". Ask for "Tracergrid" bulletin and sample.

•

Dust Collector.—Prat-Daniel Corporation, East Port Chester, Connecticut, state that they have adapted a new kind of tube into their tubular dust collector and this has greatly increased the efficiency of the equipment. For full details ask for bulletin S-250-V.

•

Impeller Breakers. — A new sixteen page catalogue describing its five models of double impeller breakers has just been published by the New Holland Manufacturing Company, Mountville, Pennsylvania. A four-page section is devoted to a description of dual impact action and cutaway drawings show how stone is reduced to desired sizes by impact in suspension with twin whirling impellers inside the breaking chamber. Another section illustrates the breakers installed as skid-mounted units. Copies of the bulletin are available.

•

Instrument Catalogue. — Minneapolis-Honeywell Regulators Co. Ltd., Vanderhoof Avenue, Leaside, Toronto 17, have released a fifty-six page catalogue which describes the Company's products. A special attempt has been made in indexing and arranging pages to facilitate use and where possible, items and pages have been collected and indexed under product group headings. In order to keep the catalogue to a useful size, only the most popular items manufactured by the Company are described. Ask for Catalogue No. 9.

•

Annual Report. — The Shawinigan Water & Power Company, Dorchester Street at Beaver Hall Hill, Montreal, were recently awarded the "Oscar of Industry" for having produced the best 1948 annual report of any Canadian corporation. For copies of the report, write to the Public Relations Department of the Company.

•

Welding Apparatus. — A new thirty-six page booklet, "Unionmelt Apparatus Catalog", is now available from Dominion Oxygen Company Ltd., 159 Bay Street, Toronto 1, Ontario. The booklet contains information on Unionmelt apparatus and supplies for submerged melt welding. Sections added include the portable DS welding head, the shape welding carriage and the flexible welder. These welding machines together with new welding rods and new grades of compositions have been developed since the previous catalogue was published. Copies are available.

•

Ditcher. — Gar Wood Industries Inc., Findlay Division, Findlay, Ohio, have issued a new eight-page colour bulletin

Buckeye model 306 Utility Ditch-
for bulletin 306.

•

le Hose. — Canadian Fairbanks-
Co. Ltd., 980 St. Antoine Street,
real 3, Quebec, are Canadian dis-
ors of American "Flexible" Metal
and Tubing. Descriptive bulletins
s equipment will be forwarded on
est.

•

Glass Blocks. — Hobbs Glass Limited, London, Ontario, are releasing a new booklet "The Mark of A Modern Building — PC Glass Blocks".

The publication contains forty pages and covers the complete line of glass blocks manufactured and distributed by this Company. Construction details, technical data, catalogue of sizes and shapes, architectural specifications, and uses, are covered in the booklet. A limited number of copies are available.

•

Construction Equipment. — Aveling-Barford Ltd., 9 Brule Gardens, Toronto, offers a twenty-page, pocket size booklet entitled "What we Make". The booklet carries descriptions and photographs of the complete line of road-making, building, and contractors' equipment manufactured by the Company in Grantham, England.

•

Worm Gear Reducers.—The Cleveland Worm & Gear Company, 3249-59 East Eightieth Street, Cleveland 4, Ohio, has released an eight-page two-colour bulletin on "Speedaire" fan-cooled worm gear reducers. Address your requests to the address given above or to Peacock Brothers Ltd., Ville La Salle, Montreal, Que.

•

Variable Speed Transmission.—Revco Incorporated, 405 Thorpe Building, Minneapolis, Minnesota, has issued a four page bulletin in which is introduced a new type of variable speed transmission. The folder describes the transmission and explains in detail its operating principle.

•

Crushing & Screening. — Nordberg Manufacturing Company, Milwaukee 7, Wisconsin, has produced an interesting engineering brochure containing many drawings, with suggestions for arranging equipment to make up complete portable and semi-portable crushing and screening plants. The title is "Symons Cone Crushers and Symons Vibrating Screens in Portable and Semi-Portable Plants". Address requests to J. D. Grace, at the address given above.

•

Welding Periodical.—The Welding Review, published by Canadian Liquid Air Co Ltd., 1111 Beaver Hall Hill, Montreal, Que., is one of the most informative Canadian periodicals dealing with welding processes. "The Welding Review" is now in its 24th volume and many thousands of copies are distributed each month. The publisher will be pleased to place *Journal* readers on the permanent mailing list.

•

Slide Rule.—Pickett & Eckel Inc., 1111 South Fremont Avenue, Alhambra, California, has released, in condensed form, descriptive material on a new type of slide rule which "simplifies quality control calculations".

•

Appointments and Transfers

W. T. E. Duncan has been appointed national supervisor of Honeywell installation and service. This is a newly created post at the Company's head office in Toronto. Mr. Duncan's department will handle all the installation and service work for the commercial and heating controls division of the Company.

•

J. H. Berry, C.M.G., O.B.E., has been appointed director of manufacturing at A. V. Roe Canada Limited. He will be responsible for the co-ordination and direction of all the Company's gas turbine and aircraft manufacturing activities.

•

Northwest Distributors Ltd., Vancouver, B.C., have been appointed as agents for the Nordberg 4FS-1 Diesel engine. This model of the Nordberg engine is a single cylinder, 4½" x 5¼" unit rated at 15 hp. at 1,800 rpm. and at 10 hp. at 1,200 rpm.

•

Robert E. Hunter has been appointed director of sales of General Motors Diesel Limited.

•