Agric

The

Letters of Agricola

On the Principles of Vegetation and Tillage

WRITTEN FOR NOVA SCOTIA,
AND PUBLISHED FIRST IN
"THE ACADIAN RECORDER,"

By JOHN YOUNG,

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INDEX

AGRICOLA'S LETTERS.

No. 1.

I HAVE long repined in secret at the lamentable state of our Agriculture, and beheld with no small indignation the constant and unceasing drain on our specie, for the purchase of American produce. I have revolved the subject in my mind, with more than ordinary attention; I have conversed with all classes of people, with a view to gather information; I have even traversed the province in different directions, keeping my eye fixed on its present state, its capability of improvement, the obstacles which oppose its progress, the incitements within our reach, by which to quicken and animate its industry; and I now intend, through the medium of the RECORDER, to lay before the public, in a series of letters, the result of all my thoughts and observations. The discussion, on which I am about to enter, is, I know, big with interest, and requires scientific, as well as practical skill. It would be presumptuous to prefer any claims to the public ear, on the very threshold of the inquiry, yet I cannot resist calling on all to a deep and serious attention, and requesting, that the views I am going to exhibit, and the topics to discuss, may form the subject of general conversation among practical farmers. If I shall advance any errors in theory, let them be instantly, through the channel of the press, called in question and corrected. In the experimental details which I shall quote, and which shall be drawn from the Agriculture of Great Britain, of Ireland, of France, and in a few cases, of Italy, shall be deemed unsuitable to this province, from the peculiar nature of its soil and climate, let the circumstances of difference be pointed out and ascertained. By such means new information will break in upon our practice; and we shall advance under the guidance of the understanding to more improved modes of operation.

Agriculture is not an *Art*, which may be acquired, like other mechanic trades, by patient drudgery and plodding dulness. It consists not in the corporeal ability of turning the glebe, and blindly committing the seed "to the faithful bosom of the earth"—thus entrusting all to the unassisted efforts of nature, without the direction of scientific skill. The ignorant and unlettered boor is no more capable of being an enterprising and successful farmer, than the team which he drives. His ill-directed and unenlightened efforts may fell the forest and burn the timber, and in this way obtain a stunted and ungenerous crop: but he wants the talents and address to court vegetative nature in her cower moods, to draw forth her latent beauties, and induce her to display the full luxuriance of her charms. These, she only reveals to those ardent and scientific admirers, who penetrate her sequestered recesses, who study her in all the windings and mazes of vegetation, and labour to acquire the knowledge of soils, the application of composts and manures, the structure of implements, the habits of plants, and all those philosophical improvements, to which husbandry has been indebted

during the last century, and which have been converting England, France, the Netherlands, Italy, and great part of Germany, into little short of well cultivated gardens. There is perhaps no other application of our active powers, which requires so much science as Agriculture, and there is none upon which, in this country, less has been bestowed. From the Press have emanated no lights to direct the husbandman in his efforts; and from the Legislature no enactments of sufficient efficacy, to stimulate his sluggish torpor. He is consigned to *ignorance, and to languor; and he aspires to nothing more than the *independence of poverty.* He rears his miserable hovel, in the skirts of the unsubdued forest; he plants a few potatoes, to eke out a wretched existence; and remote from life and all its elegances, he tastes little of comfort, and knows nothing of splendour. His ambition rises not above the possession of a little herd, which crop around his dwelling the scanty herbage; and of a patch of ground, where the energies of vegetation waste themselves in rank and poisonous weeds, and in polluted grasses. Such is nearly the picture of our provincial Agriculture; and in those districts, which abound with intervals and marshes, and where a more judicious system has obtained, there are abundance of images crowded into the back ground, to humble all ideas of superiority, and teach us, at what an immeasurable distance we are yet placed from any thing like real improvement. It is a reproach to this Province, possessing a population of only about 77,000, and an extent of territory, reaching in length upwards of 200 miles, and in average breadth about 50, to be in absolute dependence for bread on its neighbours; and these too merely suffering our trade as an indulgence, and disposed at all times, to vilify our government, and to treat ourselves with a provoking assumption of superiority, which has been heightened by a few victories in the recent struggle, and was first inspired by an overweening conceit of their own political and physical importance. How long they will vouchsafe to receive our dollars for flour, is at present, problematical; as they testify a spirit of hostility against every commercial arrangement, and seem prepared to throw obstacles in the way of all †direct intercourse.

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*Sola res justica, quæ sine dubitatione proxima, et quasi consanguinea sapientiæ est, tam discentibus egeat, quam magistris. Columella, Liber I.

†At the period of writing this, a feeling of irritation had been excited between America and these colonies. Various acts had received the sanction of both Legislatures to regulate the commercial intercourse between the two countries, without begetting that unanimity and good will which inspire confidence, and are essential to trade. Nova Scotia had attempted to monopolize the carrying of its own Plaister; and in the year 1816, enacted, That this article, which was deemed indispensable to successful cultivation of the American territory, "Should not be landed or put on shore at any port or place eastward of Boston, nor transferred to, or put on board any American vessel at any place eastward of Boston, under the penalty of the forfeiture of every such ship or vessel, from which such gypsum should be unladen, contrary to the provisions of this act."

The object of this measure was to secure to our own shipping the exclusive trade of this bulky article; and to compel our neighbours, to receive their supply of it from colonial bottoms. This regulation, on our part, was met by an act of congress passed the 3rd of March, 1817, by which it was provided, "That no plaister of Paris, the production of any country or its dependenices, from which the vessels of the United States were not permitted to bring the same article, should be imported into the United States;" and in which, too, it was further provided, "That when the prohibitory regulations regarding Plaister should be discontinued by any foreign nation, or its dependencies, the President was authorized by proclamation to remove the restrictions imposed by the said act of Congress."

In 1818, the province of Nova Scotia repealed the above act, and on the 23rd of April, the same year, a proclamation was issued from Washington annulling the restrictions. But this counteracting system of retaliation was not long confined to Plaister. The American govern-

They wish to stand on high ground indeed, and dictate to Great Britain the manner in which her flag, and that of her colonies, shall be admitted into their ports. The system of colonial policy, which has grown up in Europe without complaint and which has been approved of, and acted upon by the different independent governments there, has been looked upon with an evil eye, by these haughty Republicans ; and nothing will propitiate their pride, but the abandonment of its fundamental principle, which has all along dictated the exclusive trade of the colony in behalf of the parent state. All colonial vessels are to be excluded from their ports, because theirs, forsooth, are shut out from the colonies ; and in consequence of their holding the staff of life, they mean to chastise the British nation into obedience, and make inroads on the established rights and privileges of the government. It is high time for us, amid prognostics of such danger, to look round for safety, and to husband and improve our own internal sources of subsistence. That colony must always be poor, which buys its own bread, and must be liable to many accidents, from the numerous contentions either for safety or empire, in which the protecting state may be involved. Nova-Scotia is doomed to eternal poverty, while it imports so largely of American produce ; and if its own soil is so unblest by nature, as to be incapable of feeding the present population, it is vain for us to strugle against our fate. It will be more manly to abandon it at once, and leave its bleak and cheerless rocks to their native sterility. That portion of the globe, which cannot produce bread for its people, is no place for the multiplication of the species, or for the expansion of dignified and independent sentiment. If such be the case with this province, let us consign it without a sigh, as an undisturbed haunt to the moose and to the bear. This is the language I know, of a certain gloomy class of declaimers. They look forward to a gradual but certain decay of all our resources and wealth ; they predict the fall of all lands and real estate ; they remind us of the abundance of specie during the war ;

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ment proceeded farther, and interdicted the entrance of all vessels, which belonged to, and sailed from any foreign port, to which theirs were denied admittance ;—a measure apparently founded on a strict reciprocity of trade, but which was directly levelled at the colonial policy of Great Britain, and meant to embarass her dependencies in this quarter of the globe ;—and, above all, was a bold and unwarrantable infringement on the established mode, by which commercial intercourse had been hitherto conducted between the two countries.

This act which, in its leading features, bore the character of a non-intercouse bill, naturally changed the whole complexion of the American trade to these Provinces. Before this period, it had been the invariable practice of the Colonies, to send their own vessels to the States for whatever lumber or agricultural produce their wants might require, while their ports remained shut against the American flag. This new measure of the United States broke in violently upon this order of things, and threw seemingly insurmountable barriers in the way of all future dealings. The British Government relieved her North American possessions from this perilous and difficult situation by erecting Halifax and St. John into Free Ports, and there admitting American vessels to entry.

At the date of this letter many vague reports were afloat, that the Americans would not recognize these Free Ports, but rigidly interpret their own restrictive law. To that extremity, as the event has shown, they have not proceeded ; but at present take advantage of the indulgence, and permit their own vessels to trade hither, while they debar from their own harbours the vessels belonging to Nova Scotia or New Brunswick, even although sailing from Halifax or St. John.

The trade of these Colonies is thus entirely reversed ; their shipping is driven from a profitable channel of employment ; and one of the strongest bulwarks of the colonial system is overthrown. This state of things suggested *then* the expediency of these agricultural letters, and furnishes *now* powerful and additional motives to all of us to improve the internal resources of our soil, that the mother country may speedily return to her accustomed course, which has preeminently, secured her own glory, and contributed towards the safety and prosperity of all parts of the empire.

of the extravagant rents in the capital; of the rise of land in the country; and they triumphantly pass in review the altered state of things—the disappearance of dollars—the fall of rents—the depression of farms—the general complaints of poverty—and, as the last stage of our declension, the obtrusive and loathsome spectacle of beggary in our streets. They unhesitatingly maintain, that this Province cannot thrive, but during war; that it can only flourish on the miseries of mankind; that Halifax cannot be sustained but on the spoils of plundered nations, and that all the aids and props, given to our Agriculture and Fisheries, either by legislative bounties, or by private subscriptions, may suspend, for a while, but cannot stay our final ruin. That, doom, say they, is sealed, and irrevocably fixed in the absolute necessity we lie under of importing bread. These, it must be confessed, are alarming symptoms and melancholy prospects, and if true, "there is no hope for us but despair, no relief but death."

But in what consists this physical inability in the Province, to provide for its inhabitants the means of subsistence? Not in the *Soil;* for there is enough of alluvial alone, if placed under active and judicious management, to support the population—keeping out of view entirely our rich loams, which are always propitious to the husbandman, and which abound throughout the Province. Nor in the *Climate;* for our summers are sufficiently long and warm, to bring corn of whatever description to maturity;—and in addition, the more our forests are cut down, the more will the temperature of our atmosphere be meliorated. There are certainly then some rays of hope, to brighten the dark horizon of Nova-Scotia; and it will be found, that our increasing poverty may be traced to ignorance and inactivity, not to the niggardliness of nature, nor to the want of physical capabilities.

The great defect, under which our Agriculture labours, is the want of general and scientific principles, among the practical farmers. There is a total ignorance of the very first rudiments of the science; and by many, I shall even be derided, for applying this denomination to Agriculture. There is little or no circulation of sentiment among that body of men; and the absence of Agricultural Societies is a decisive proof of the low and degraded state, which the profession occupies. The first grand step towards internal improvement must be the establishment of such societies, in every county, and in most of the townships,—which should hold stated meetings for the discussion of all matters of common interest, and for the adjudging and distribution of prizes, on subjects, which have been previously announced and published in the newspapers. These institutions would dignify rural affairs; would excite a principle of emulation; would draw attention to useful discoveries, and would gradually introduce a more effective and enlightened mode of practice.

Halifax, July 15, 1818.

No. 2.

I CONCLUDED my last letter with recommending the institution of Agricultural Societies in different parts of the Province; and I just glanced at some of the more obvious benefits, which must result from establishments of that kind. It must be apparent, however, that to give such associations their full and beneficial effect, there must be amongst them some centre of union, some Board to which they must all look up, as the prime director of their movements, and as the focus of their converging influence and collected energy. Halifax is unquestionably the place must suitable for this central Society; and it should be composed of men, who have a warm interest in the improvement of the country, and public spirit enough to bestow their services gratuitously in furthering such a patriotic undertaking. I do not pretend to be so fully versed in all the bearings of this question, as to propose a Charter to this Board of Agriculture, without further and more mature inquiry—although the internal cultivation of our territory be an object of sufficient magnitude to merit such attention and patronage from the Legislature; yet I shall not hesitate to avouch boldly, that such an institution should be taken under the care of our leading characters, who should both contribute to its funds by their bounty, and should animate and invigorate its pursuits by an enlightened and elevated encouragement. All great improvements in the progress of society have originated with men of liberal views who being raised above the petty calculations of sordid interest, magnanimously offer on the altar of public utility the devotion of their hearts, and the inspiring influence of their example.

The first grand impulse given to Agriculture in the United Kingdom was communicated by men of exalted spirits, who, although not themselves engaged in the occupation of farming as a profession, studied it as a science, and perceived its subserviency to national felicity and independence. The gentlemen and landholders in Ireland formed themselves into an association for the purpose of improving husbandry and other arts, and in the year 1749 were incorporated by charter under the denomination of the *Dublin Society*, which had the honour of being among the earliest in Europe; and although at first its efforts were feeble, it has contributed in a remarkable degree towards the prosperity of that portion of the British Empire, but still more, it has been extensively useful in setting a noble example, and in directing the labours of scientific men into this useful field of inquiry. In 1784 a number of gentlemen either connected with, or born in the Highlands of Scotland, assembled at Edinburgh, and passed a resolution to take the sense of their countrymen on the propriety of forming an *Institution* for internal improvement. From this small but auspicious beginning the *Highland Society of Scotland* derives its origin; which was, in three years after, established as a corporation by *Royal Charter*, and procured a grant of the money paid on the restitution of the forfeited es-

tates. Notwithstanding the restricted character which its name would seem to imply, this society extends its patronage over the whole of North Britain ; and has been singularly serviceable, by a judicious and liberal distribution of rewards, in rousing the enterprize and facilitating the progress of the Scottish peasantry. Sir John Sinclair, after having travelled through the most interesting parts of the Continent with the sole view of transplanting into England whatever beneficial institutions might strike his eye, made his motion in Parliament on the 15th May, 1793, for the establishment of a Board of Agriculture, and in the August following succeeded, in the face of much opposition, and contrary to the expectations of his friends, in getting the Charter drawn up, and sanctioned by the Great Seal :—so late, it seems, has the attention of mankind been powerfully attracted to this first and most important branch of national industry. From that latter period down to the present, which includes a space of only twenty-five years, Agriculture, under the superintendence of these scattered institutions, and of the other societies which almost instantaneously sprung up like enchantment over the whole kingdom, made the most rapid advancement, and contributed in no small degree to sustain Great Britain in that protracted and tremendous struggle in which she has for the last twenty years been measuring her strength with the gigantic power of France. Cut off from Europe by the progress of the French arms, she was thrown back on her own resources ; and had her native fields been inadequate to the support of her population, she must have yielded to the victor and lost her preponderance in the scale of European Politics. In the States of America Agricultural Societies are founded everywhere ; and nothing has exerted so direct and powerful an influence on their growing prosperity and lucrative commerce. These public spirited institutions have been also long ago established in France, even under the sunshine of Royal favour ; and they have made their way into Germany, into the Italian States, and in fine, to wherever the human mind has been sufficiently enlarged to perceive, that the comfort and happiness of our race rest on Agriculture as a sure and permanent basis.

After these introductory remarks, I shall proceed to describe the constitution of the Agricultural Societies which are required in this Province ; the practicable objects which, under existing circumstances, are placed within their reach ; and lastly, the manifest benefits that must grow out of their formation and encouragement.

A sketch of the central Society proposed in Halifax will serve as a model, with a few variations, for those which may be established in various quarters throughout the Province ; and in fact the constitution of these may admit of very considerable differences influenced by local peculiarities, without in the least endangering the great purposes of their formation. The subsequent delineation, on that account, may be admitted with a great degree of latitude, and may be considered not so much as a pattern for imitation, as a rude outline, which may be filled up according to the circumstances of particular districts.

The central Society (unless it shall be constituted by Charter, and endowed with a Legislative Grant—in which case several modifications would enter into the plan);) should be composed of a President, a Treasurer, a Secretary, an Under Secretary and of six Gentlemen selected from the body of the ordinary members, three of which last should go out of office every year, and be succeeded by a like number chosen by ballot, to complete and form a standing Committee. Five of these should always constitute a quorum. There should be four meetings annually; the first to take place about the end of February or beginning of March, while the General Assembly is in Session; and the rest in order at the end of every quarter. The business of all the other inferior Societies should, through the medium of the Secretaries, be brought up to the Board, as the organ through which to condense and circulate all Agricultural information. A report should be prepared and published every three or six months, embracing all the valuable communications which may have been received—the hints at improvement which have been suggested—the experiments that ought to be tried—and the objects of inquiry which the Board is solicitous to investigate and ascertain. These Reports must, in the first instance, be published at the expense of the Institution; but the sale of them will, generally speaking, refund the outlay, and the loss, if any, should be borne by the joint contributions of all the Agricultural Societies. The Honorary Members of the Board should be unlimited: and should comprehend His Excellency the Governor, with other principal official characters, as well as the members of General Assembly. A fund must be created by an annual subscription, which will naturally be augmented by voluntary aids from the Honorary Members and other patriotic individuals.

The practicable objects, which may be effected by such Societies, are neither few in number, nor unimportant in their results. And I shall only touch on those of a prominent character, for they all will naturally press on the attention, so soon as such meetings are constituted, and are in correspondence.

First. The different publications in Europe, and particularly in England, which have of late years issued from the Press, and which have tended to enlighten agricultural operations, will become accessible to all the members of the societies, and will rapidly dispel that total ignorance, which, like the gloom of midnight, has cast over us a darkening mantle. Rural affairs will necessarily become topics of conversation and general interest; and many of our wealthy merchants will be tempted to vest their capital in the cultivation of the soil. The establishment of Agricultural Societies in the old country was followed exactly by such results. Capital was drawn from trade and manufactures to the plough—experiments were made on a large and liberal scale—and the progress of improvement was instantaneous and unprecedented. Agriculture was raised to the dignity of a science, its laws were studied and explained, discoveries trode on the heels of each other in rapid succession, and the face of the country was changed in a few years.

Secondly. Such Societies will naturally import all sorts of seed corn as well as the new varities of grasses and of leguminous plants, which have been lately introduced and cultivated in Great Britain, and which have so materially augmented the produce of the soil. It would be useless to enumerate any of these latter as they are not known to our farmers even by name, and I must therefore wait till some more advanced stage of this inquiry, when the minds of my readers shall have become more familiarised with the objects and terms of the art. By these importations the aggregate produce of the soil will be vastly augmented, a greater disposable surplus will be thrown into the market, to meet the accumulating consumption of the inhabitants; roots and artificial herbage will furnish to our live stock a more generous and nutritive food; and our agricultural resources will keep pace with our growing knowledge.

Thirdly. By these Societies all the arts will be improved and encouraged, which are either intimately or remotely allied to Agriculture. This is a matter of more radical importance than appears at first. The farmer depends, for the successful and prompt execution of his labours, a good deal on the mechanics who have set themselves down in this neighborhood. If they be unskilful and irregular, these very defects of their character are strongly marked in the structure of his implements, and often mischievously felt, in the loss of valuable time, and of many golden opportunities for accomplishing his field work. The Spring, in many of our poorer settlements, has long dissolved the frost, and "led in vain the western breezes up the hill," before the plough, with all its necessary appendages, can be repaired by the blacksmith; and when obtained, it is at best an awkward and ill constructed instrument, made up of varying and discordant parts.

The local Societies, therefore, would find it of general interest, to encourage skilful mechanics, as smiths, carpenters—and steady labourers, as ditchers, limeburners, drainers, to settle in the Districts over which their authority extends; that the members may derive a benefit from the ingenuity of the one, and the orderly and staid habits of the other. They should likewise confer premiums on whatsoever improvement chance or perservance may find out in the construction of the implements of husbandry; and thus the whole inventive faculties of the community will in a manner be placed under requisition, and urged to the most ardent and intense efforts. Even the discovery of any useful mineral, which may serve as a manure or fuel, should not pass without receiving some mark of meritorious distinction. The love of fame is so deeply implanted in our nature, and endowed with such irrepressible elasticity, that its gratification will be preferred by many to any ordinary increase of fortune; and public Societies possess the decided advantage of being able to touch this powerful spring of human action. In that way the English and Scottish Institutions are stimulating, scarcely more every class of mechanics than every order of men, to the utmost exertions. The rewards which they have bestowed, and the mention of them in their printed transactions, have done more

in behalf of Agriculture and its subsidiary arts, than could have been effected by the more common principles of conduct, which operate in procuring the means of subsistence, or in accumulating wealth. To obtain a silver or gold medal has often cost the successful candidate ten times its nominal value.

Among the attainable objects of melioration I shall mention lastly, that Premiums from the funds of the Societies may be held out to those enterprising individuals, who shall strain at improvement, and take the lead of other competitors. I shall run over a few of those, which without much thought strike me as of greatest practical utility. Let three premiums, rising in value, be assigned separately to those farmers who, in any part of the Province, shall cut down, burn, and sow the the greatest number of acres of woodland during any one season; apportioning the prizes according to the scale of their merit, and let the names of the successful candidates, and their places of residence, be inserted in the Reports of the Board, and in the Newspapers. Let other premiums be given to those, who shall during any one year raise the greatest quantity of Wheat, of Barley, or of Oats; and thus the spirit of emulation, and the honor of successful ambition will prove powerful stimulants in all the agricultural districts. The man, too, who raises the fattest ox, or who produces the finest stallion, or, if you please, the largest hog may enter the honorable lists of competition, in the annual shows afterwards to be appointed, and may participate in the gratifications and triumphs of the day. In short, every object of internal improvement either on the soil, the produce, or the stock, may form the subject of a premium; and in this way the Societies possess the power of directing the industry, and stimulating the genius of the country in whatever department they are desirous of making progress.

I shall defer to my next letter, the last branch of my subject, viz. the advantages to be reaped from such institutions; as I fear the length of this will have tired out even the most mechanical patience.

Halifax, July 22, 1818.

No. 3.

I PROMISED to devote this letter to give an account of the *advantages* which would accrue to the Province from the establishment of Agricultural Societies, holding with each other an intimate union, and aiming at the same common ends. The mass of my readers must have, in a great measure, anticipated from the previous illustrations all I have to say on this head. Indeed, it is easy to foresee the effects, which would necessarily result from a combination of the talents and enterprise of so many individuals, contending in the same race of honorable competition, and urged in their course by the most powerful of all incentives, which, while they act strongly, run no hazard of interfering with each other, or exciting jarring interests. This is the peculiar feature which distinguishes Agriculture from all other pursuits; that the success of any one man, instead of retarding, actually accelerates the general progress, and his inventions and discoveries become the common inheritance of all the cultivators of the soil. Here, the rivalships of business, the collision of commercial arrangements, the jealousies of capital, the grasping selfishness of cupidity have no place. These peaceful occupations may be prosecuted with the utmost activity without producing those discords and animosities, which disturb the harmony of society, and exhibit the most humbling views of human nature. Among farmers there never have been, in any country, secrets of trade, concealments, distrusts and all that loathsome brood of passions, which have raged in commerce since the first dawn of civilization, and so often set the world on fire.

There is something in rural affairs, which invites to reciprocal confidence, and the most unreserved communication; and which serves to repress, or at least much to moderate the strifes of ambition. The produce of the globe has never been too abundant for its inhabitants. There has always been rather a scarcity than an excess of provisions, and, in consequence, the farmer never dreads the effects of a permanently glutted market, because he has never felt them. The active principle of propagation has always outstript the slow and sluggish movements of the plough. Not so in commerce. The productions of the manufacturing arts have in general exceeded the demand; and Great Britain forming only a little speck on the terrestrial map, is capable of being the workshop of both northern and southern hemispheres. Her merchandize is wafted by every gale, forces its way into every market, pervades the east and the west, and in truth outgoes the consumption of the Universe. The loom and the forge are much more prolific than the soil, and their products may exist in such superabundance as to occasion a destructive reaction on industry. The fruits of the earth on the other hand, are always exempt from such inconvenience. If in any quarter they should chance to exceed the demand, either from the sudden efforts of art, or the liberality of a genial climate,

a population quickly grows up to meet and to consume them. The farmer, therefore, feels no hesitation in communicating his improvements to all, because his interests cannot permanently suffer from a full and preoccupied market. China, which is cultivated to the tops of the mountains, is at times scourged by famine, even although its agricultural industry is encouraged by the precepts of religion, by the injunctions of the civil code, and by the fostering and studied display of the patronage and example of the Monarch.

These cursory remarks will explain the nature of that phenomenon, which is characteristic of husbandry; and will show, too, the necessity of our combining in order to draw forth the utmost powers of fertility. There is here an obvious want of bread corn. We have no regular and adequate supply either of flour, of oatmeal, or of shelled barley for the use of the inhabitants: and Halifax has to import these articles from England and the States. Even those products, such as hops and barley for malting, for which our climate is supposed to be peculiarly favourable, are reared in such inconsiderable quantities, as to bring the conviction irresistibly home that a stupid and contented indolence lies at the bottom of our poverty, and that we could be richer and more independent of foreign supplies if we would resolutely shake off our supineness. At all events, the matter is worth a trial—and this trial of the productive powers of our soil and climate can only be successfully made by the organization of Societies, composed of the true patriots and well wishers of Nova-Scotia, who will not shrink from their duty by the failure of a few first experiments, but hold on in an unvarying course of perseverance and encouragement.

The first great effect of their formation would be a remarkable increase of our Agricultural Knowledge, and a consequent and necessary excitement of emulation and enterprise. I can adduce, perhaps, no more decisive proof of the gross ignorance, which prevails throughout the country on the subject of rural economy, than the total absence of all books illustrative of these affairs. I am guilty of no exaggeration in stating, that, on questioning most farmers of my acquaintance, whether they have perused the Farmer's Magazine published in Edinburgh, all of them, with the exception of two, confessed that they had never seen it themselves, and that, in fact, they knew of no copy in the neighbourhood. I have pushed my inquiries farther, and asked, whether they have ever heard of Tull's Husbandry, of Anderson's Rural Affairs, or of Arthur Young's Agricultural Tours, and the only answer I received was the broad and vacant stare of inanity. It seems from this, that our agricultural operations are left to the guidance of chance, that no pains are taken either to receive or to communicate instruction, and that the process of vegetation is consigned to the unassisted efforts of Nature. Were our husbandry in a flourishing state, these and similar publications would be the daily companions of the farmer, would mix with his thoughts, and both enlighten and direct his labours. By these he would be schooled in the practice of his art, as is the boy by his primer, and the lawyer by the statutes. They

contain the elements of that science of which he cannot remain ignorant without sacrificing both his own and the best interests of the public. The institution of Societies would place all these means of information within his reach, would excite in him an ardor of pursuit, and a thirst for knowledge; and thus gradually awake to life his slumbering faculties. His attendance upon their stated meetings would furnish him with materials for thinking, and with subjects for experiment. He would return home with his mind stored with new ideas, and stimulated to take his part in the progress of improvement. He would attend to the practice of his neighbors, and compare it with his own; he would remark the difference in both, and apply to them the standard which obtains in other countries under the same parallel of latitude. These exertions of intellect would lead to further development, and there is no point of improvement to which he may not ultimately attain. The very miscarriage of his plans would bring forth good practical results. He would be solicitous to trace out the cause of disappointment, the extraneous circumstances which may have interfered in the effect, and the means to be employed to prevent their recurrence. The communication of his own observations to the society, with the strictures and remarks of the various members, would become to him at once a source of enjoyment and instruction:—he would thus be stimulated to new efforts, and the spirit of general research diffused through the whole collective body.

Another effect of these Societies, not less valuable than the last, would be the introduction of those new models of agricultural instruments, which have been purposely constructed for meliorating and loosening the soil more effectually than those in common use; and also of such descriptions of live stock as may be supposed calculated to improve our breed of Sheep, Neat Cattle, or Horses. These in Rural Economy are all objects of first rate importance; but as the accomplishment of them is attended with much trouble, and considerable risk, it should be undertaken at the expense of a Society preferably to that of an individual.* A man hesitates, and the caution is warrantable, to embark his own capital in any hazardous speculation for the public good, while he would most cheerfully bear his share in a joint adventure. As the benefit to be derived from introducing any new implement is common, it should, on that account, be effected by means of a general fund. This consideration seems to have pointed out, that societies are best fitted for engaging in such enterprises; and, accordingly, it has been found in experience, that wherever they are once founded, and duly supported, they have always directed a portion of their attention, and destined a part of their funds to these beneficial purposes. And

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*The Philadelphia Society for promoting Husbandry went so far as to erect a manufactory from the general funds for fabricating all curious and valuable Machines, and Instruments, in order to furnish the members with the most approved models; and they even appropriated a farm, called by them a *Pattern Farm*, for making Agricultural Experiments under the direction of a special Committee. See Memoirs of the Society, Vol. II 8vo. 1811.

The Irish Farming Society, which has been incorporated for the encouragement of agriculture, has established a manufactory of implements in Dublin with a view to introduce the best kinds. Farmer's Magazine, Vol. 17-page 410.

we certainly stand in need in this Province of more effective instruments for breaking and meliorating the soil, than any now in use. The Dutch plough—a clumsy and awkward machine—disgraces our Agriculture in more than one district, and would not be tolerated a moment by the most illiterate boor in England. The common Yorkshire plough has the necessary requisites of strength and utility, but is by no means entitled to such preference as to exclude every other sort. The drill and the hoe ploughs are, I believe, in a great measure unknown, as well as all the other instruments of the new husbandry; and so little curiosity have the most of our farmers, that not one in a hundred has ever turned his thoughts to the comparative advantages of different models, nor so much as heard of the curiously constructed implements of the Horse-hoe system. The elastic spring of bettering our condition, and the more powerful impulse of necessity, which in old countries sharpen the intellect, cease here to operate with their accustomed force, where there are no taxes to quicken invention, no rents to stimulate application. A thousand blunders may be committed in the management of a farm; the productive powers of the earth, like the minds of the cultivators may remain in their natural barrenness; and yet our peasantry maintain their independence, and provide a rude and scanty subsistence. The kind and generous indulgence of the parent state, in bearing the whole weight of our civil and military establishments, and exempting us even from the slighest touch of taxation, has cast over our faculties a torpor, in which we doze away existence without exertion either of mind or body. The internal resources of the country are not called into action. A climate, superior to that of England, and which is incontestibly proved by the field culture of maize, is by our indolence pronounced unfit for the production of the cereal gramina; and in supine languor we waste the profuse liberality of nature, and wait the menacing and sure approach of penury.

If we have done little in improving the construction of our implements, we have done less in bettering the breed of our live-stock. What exertions, for instance, have been made for introducing the Leicester or Cheviot sheep? Are our stallions distinguished for strength of bone, for symmetry of structure, or for any one quality, which would constitute superiority, or insure their reception in England or France? These palpable omissions cry aloud for speedy and effectual amendment.

A third effect which would arise out of such Associations, would be the facility of obtaining a statistical account of Nova-Scotia, which would embrace the diversities of soil scattered on its surface, the convenience and connection of its lakes for inland navigation, the moral habits of the people which impart a pernicious influence to industry, the nature and legality of the tenures by which so much of its territory is held in its original uncultivated state, and to sum up all, every circumstance which has a tendency to accelerate, or retard its rising prosperity, were enlightened and scientific men engaged in preparing such accounts of their native districts, the body of evidence, which would soon be

collected, would be so rich, varied, and important, that the Board could with certainty adopt and prosecute such measures as would overthrow every barrier to improvement;—and its appeal to the Legislature on momentous occasions would come sanctioned with such authority as to be quite irresistible. The statistical account of the different parishes in Scotland, conducted under the auspices of Sir J. Sinclair, and the reports of the different counties in England, undertaken at the recommendation of the Board of Agriculture, paved the way for those rapid and unexpected strides, which Great-Britain took in the cultivation of her territorial soil: and the same causes here would be productive of the same effects.

The last benefit, which I shall at present point out, is so soothing to the benevolent mind, that were all the other advantages of a doubtful or trivial nature, this alone would invigorate and sanctify our efforts in the creation of such societies. The tide of emigration, which has for the two last years set in upon our shores, has mocked us with delusive hopes; and we have had the mortification to see it roll past, to fill the creeks and harbours of the United States. Those strangers, who visited us in quest of settlements, were taken under the care and direction of no body of men; and after wandering through our streets—the outcasts of the old world, and intruders on the new—they averted their eye from our inhospitable reception, and sought in other religions that rest which was denied them here. They would have been an invaluable acquisition, and the most of them would have remained amongst us, had an Agricultural Society existed to point out their views, and find employment for their industry. All this could be easily accomplished, were a correspondence established betwixt the different counties and the capital. The Board here could act in the capacity of a common agent, and furnish to the Provincial Associations, the exact supply of hands suited to their wants. This would remedy a very great inconvenience, felt often at present in some of our remote and insulated settlements, for which there is no existing provision. Besides, the spirit of improvement, which these societies would set in motion by turning the attention of mankind strongly to Agriculture, would create an additional demand for labour; and that demand would naturally absorb the emigration, which to this Province has been hitherto nearly useless and unavailing.

Halifax, July 29, 1818.

No. 4.

THE task I have undertaken is too complex and herculean to be achieved by the labours of any one man. I may lay down and illustrate the general theoretical principles of Agriculture;—I may unfold the nature of soils, their distinctive qualities, the remedies to be applied for loosening the stiff, and consolidating the sandy; I may expatiate on the chemical properties of manures, and the necessity of the putrefactive process for converting them into the food of plants; I may descant on the utility of the different instruments used in rural operations, and suggest hints for the improvement of their construction; I may describe the rotation of crops, the comparative benefits of different modes, and draw my illustrations from the practice of Spain, of France, of Holland, of Italy and of England; and when I have accomplished all this, to my own satisfaction, and taking the most favourable view of the case, to the satisfaction of the Public, I shall have fallen infinitely short of that comprehensive plan, which I have figured in my own mind, and which I shall embody into this series of Letters, provided a moderate support shall be given me by country correspondents engaged in practical farming, and competent to contribute the results of their experience. I invite all classes of husbandmen to a correspondence with me, addressed Agricola, Recorder Office, Halifax: and I here publicly state the conditions, on which that must be understood to be conducted.

I claim, then, the right of remaining concealed under the name I have assumed till the close of these papers: and there are many just and very obvious reasons for such precaution. No man would be safe to come before the public in his real character, while these letters were issuing from the press, unless he were indifferent to the endless animadversions, to which such undisguised, and to say the least of it, injudious publicity would give rise. His motives for writing on such a subject, his style of composition, his capacity for arranging the materials, his means of information, the errors incident to the inquiry itself, would all successively lay him open to such a volley of criticism, that he must possess no common firmness of nerve to front so formidable an attack. Besides, the discovery of his name would subject him to contend with his antagonists on unequal grounds. Few writers have appeared in our weekly papers who have been allowed quietly to leave the stage, and make their exit without encountering some opposition; and I cannot expect a greater share of good fortune than my predecessors. Some of my opinions will be combatted, my knowledge will be questioned, I may even be ridiculed as a fanciful and vain theorist, my very motives for engaging in an undertaking of such importance as the agricultural improvement of the country will be attributed by some to ostentation and vain glory, by others to an impatience at obscurity, and a restless desire of distinction; and by a few, as if in pity to human

nature, to the impulse of patriotism. No man in a small community dare become conspicuous without paying a tax for his celebrity. That tax becomes increased in a tenfold degree, if his adversaries have the advantage of knowing him in his private life. They quickly pass from his opinions, and arguments to the weaknesses of his character, and the dispute about things usually terminates in personal invective. *Investigator and Pacificus were on the point of throwing off the mask, of removing the guards from their swords, and fighting with naked instruments. The personal allusions made in the two concluding papers, would have soon ended in direct hostility, had not the clerical combatants prudently dropt a subject, which of all others trenches on the strongest and most inveterate prejudices of the human heart, and with peculiar acrimony imbitters religious rancour. Silence became their true wisdom, and it would have been folly to provoke inexpiable resentments. Under the disguise, therefore, of a harmless name I shall be better armed to parry the trusts which may be made at me, and to serve the public too, more successfully by withdrawing the attention of my readers from myself, and compelling my antagonists to confine their replies and observations to what I may deliver.

In addition to all these considerations, I am justified in this concealment by the practice of most periodical writers. The Spectator, the Guardian, the Rambler, the Idler, the Mirror, the World, made their first appearance under these fictitious appellations, and although I do not claim kindred to these celebrated names in elegance and copiousness of diction, in depth of research, or in comprehensiveness of plan, I am more than on a footing with them, in the paramount importance of my subject; and may therefore, without any sort of affectation, be permitted to shelter myself from the public gaze under the shade of their venerable authority.

In the second place, it must be clearly understood that in me is vested the sovereign disposal of all communications. Some of these I may publish without the slightest alteration, others with some changes on the disposition and language; from some I may extract only what I deem valuable, and others I may entirely suppress. I can assure those, nevertheless, who may honor me with their correspondence, that I shall be alive to every improvement they suggest, and that I shall give publicity to every useful experiment they have tried, and found successful; that all important information regarding the soil, the implements of husbandry, the live stock, the best modes of ploughing, of

*This is one of the evils arising out of a confined society. Every individual of the least pretensions to talent is known in the minutest traits of his character; and the moment a controversy begins in our public papers, curiosity is on the alert to find out the persons who are carrying it on—and much more anxiety is felt for this discovery, than for the matter in dispute. The vanquished party, if the least successful in his search after his opponent, in most cases takes refuge in grossness and scurrility; and answers all the arguments which have been urged against his doctrines by direct or indirect allusions of a personal nature. This propensity in our Provincial literature (for hitherto we have had little more than the ephemeral productions of a news-paper), was exemplified, though in its milder symptoms, by the two clergymen who fought under the names of Investigator and Pacificus; and was afterwards, during the progress of these letters, several times illustrated in dreadful violence by the partizans whom they created, and who proceeded against each other to the utmost lengths. This concealment, on the part of Agricola, was prudent in the outset, and essentially served to promote the accomplishment of his plan.

fencing, of draining, of winnowing and preserving the crop, the most efficacious remedies either to prevent or cure the diseases incident to cattle, and, in short, that all information serving to throw light on rural affairs shall find a place in some shape or other in these my future letters. I invoke every lover of Agriculture,—every friend to the country, gladly to seize the opportunity thus held out, of making public whatever he knows to be an improvement on the practice in his own country, or beneficial to the community at large. A thousand subjects may form the groundwork of these communications: if all throw in their mite into the general fund, the collection of knowledge will exceed all our hopes, and be rich beyond example. The vast waters of the Mississippi if traced to their remote and ultimate sources, will resolve themselves into the tributary contributions of innumerable but insignificant rills.

In the next place, all letters addressed to me must be dated as to *time* and *place*: and whenever experiments and facts are adduced to strengthen or substantiate the conclusions of the writer, they must, in that case, be subscribed by *real signatures.* The distinction, I have drawn between these two species of communications, is essentially necessary in the nature of things, as well as for the success of my project. I can take no exception against receiving anonymous papers of a general and speculative kind, and using these so far as they are subsidiary to my main plan; although, at the same time, I cannot bestow on them that encouragement, nor pay them the same devout attention, which shall be extended to practical pieces written by farmers in a plain and even uncouth style, and detailing the facts which have fallen within the sphere of their own observation. To this latter class subscribing their real names I particularly apply for assistance, and promise them that, while I preserve faithfully the matter, I shall retouch the language, and remove any little errors in grammar, which may disfigure their writings, and shall dress them in an attire fit for public inspection. None need be afraid to address me, who have facts to communicate. All they should aim at is clearness and simplicity, and leave to me the task of arrangement and composition. Many of them I know, are competent to convey their thoughts with considerable correctness; and when I am favoured by such, their essays shall go to the press without further polish or amendment: for I shall use my editorial authority only to rectify blunders and lop off redundancies. In an infant country like this, where education is not generally diffused, and where the habits of writing are of difficult attainment, such a censorian power will not be felt as a burthen, but hailed as a useful auxiliary; and I shall strive to make it fall as light as the laws of a mild criticism will tolerate. The original communications, addressed to me as Agricola, shall be subjected to no scrutiny save my own; and after they have been perused and disposed of, they shall be locked up in the recesses of an inviolable secrecy. To all these papers I request as a favour the subscription of real names, and these I must have the liberty of quoting in testimony of the facts and experiments to be brought before the public.

There is no other way of establishing them but by an appeal to living witnesses ; and hence in the Farmer's Magazine published in Scotland, the communications are printed with local dates and genuine signatures. The same plan is adopted in the transactions of the American Agricultural Societies—a proof both of the propriety and necessity of such references.

Lastly, all communications sent me must be strictly agricultural, as matter of a foreign and extraneous character shall be expunged even from those, which on the whole are meritorious. The columns of the Recorder, under the direction of Agricola, will be open exclusively to the followers and abettors of farming, and he must reject all speculations about general trade and the fisheries, even although these may be extremely valuable in themselves. It is the husbandry of the Province, and that alone, which he is solicitous to promote ; although at the same time he is no enemy to the other sources of our prosperity. He forewarns also his future correspondents against all allusions, which may be deemed personal, or by implication may glance at any well-known or conspicuous character, as all such papers shall be condemned without mercy, and consigned to merited oblivion. Nothing shall find its way to the public eye not allied to Rural Economy, or which has a tendency to interrupt general harmony and mutual good will—the natural concomitants of the plough, and the genuine offspring of its peaceful labours.

Such are the terms which Agricola openly announces for the regulation of his correspondence ; and should they not meet with full approbation, they are sufficiently innocent, at least, to escape censure. He is amply sensible of the task he is taking on his shoulders, of the pre-eminent importance of discussion to excite attention, of the little interest which has hitherto been felt about this valuable and neglected branch of national industry, of the difficulties to be encountered, as well as of the glory to be won, and on all these accounts he shall be careful to redeem the pledge at the finishing of his course which he has thus given at the outset. He calls upon all those, actively engaged in the occupation, to contribute freely their quotas to the general stock of information, and to furnish him with materials drawn from practice and actual observation. Let the state of our Agriculture in all the different counties be laid before the public—let the errors, which may have grown up from inadvertence, be fearlessly exposed—let remedies be prescribed, let facts be collected and appealed to, let experiments be tried—and from the operation of these combined effects Nova-Scotia will rise from her embarrassments, will be renovated with fresh vigour, and will cast off her slavish dependence for bread on a dangerous and insidious enemy. But above all, let not those capable of giving information be deterred, from my writing under an assumed name. It would have been better had a Board been previously established, and all communications made to an official Secretary ; and such a plan would have been adopted but for an insuperable callousness in the public feeling about Agriculture and all its concerns. This art holds

so abject a place in general estimation, that I met only with repulsion and discouragement from all such as I addressed to aid me in the furtherance of my scheme. To this mode, then, of arresting our careless attention I have been driven as to a last resort, and should it succeed, it may usher in the establishment of an Agricultural Association, and the opening of more auspicious prospects. Did it not savour of vanity, I might be tempted to state, with a view to strengthen my claims on liberal communications from all parts of the Province, and from all ranks of men, that should I reveal myself, neither my motives, situation nor character will, I trust, suffuse a blush into the cheek of any who may deign to carry on a correspondence with Agricola.

Halifax, Aug. 5, 1818.

No. 5.

IN my last I stipulated the terms on which I would receive agricultural communications: and on further thought I am so completely satisfied as to their propriety and importance, that I do anticipate from my friends, not merely an approval of the spirit—but to the letter of them, a prompt and respectful obedience. The writer, who steps from the walk of private life in an assumed or fictitious character, in order to convey instruction, deserves some little deference, and has an undoubted title to dictate the way and manner in which he will serve the public. I request, then, that no offence be taken at the rules laid down for correspondents, because they are the fruits of sober reflection, and will not for that reason be broken through either at the solicitations of friendship or the sneers of impertinence. They constitute the rampart in which Agricola has entrenched himself, that he may accomplish his scheme without disturbance, and be free from the annoyance of doltish imbecility. The annunciation, however, of these terms is only discharging the half of my duty. It becomes me also to delineate the general plan of my inquiry, for the guidance and satisfaction of those who may vouchsafe to me their correspondence. Without such an exposition of my system, their communications can neither be useful nor well-timed. They may write on that part of the subject, which cannot be overtaken till the whole interest be lost and evaporated. They may be so late in transmitting their remarks, that I cannot avail myself of their help, without disturbing the order I mean to pursue in the development of my plan, and which, from being systematic, will admit of few digressions. On these accounts, I must venture on a methodical division of my subject, although I am sensible of the danger of erring, while I have neither matured fully my ideas, nor assigned them their proper disposition. There can be no greater difficulty than this, nor anything more embarrassing to a periodical essayist, unless he shall have used the precaution of bestowing on the whole treatise the last touch and finishing, ere any part be committed to the press. What is once published he cannot recall, and over it he loses the power of amendment and further illustration. Notwithstanding this impediment in my way, I cannot avoid in justice to my correspondents, sketching a formal and regular outline of my plan, and I give it under a deep sense of its many imperfections, reserving the liberty of rectifying these as I proceed in my course.

I shall divide my subject into three great parts. The first shall treat of the principles of vegetation and tillage—the second, of the management of live-stock—and the third, of all the miscellaneous matter connected with Agriculture, and which either further or keep back its improvement.

Some of these last, although we are so distant from them in the inquiry, it may be proper now briefly to notice. Under the third head I shall describe the expense of obtaining grants of land from the public

offices—the occupancy of extensive and valuable tracts in an uncultivated state—the existing laws regarding the importation of American produce, and their effects on industry—the legislative aids which have been given towards the formation and repairing of roads throughout the province, and which should be extended, if at all practicable, to the completion of an inland navigation by the chain of the Shubenacadie lakes. I shall also advert to the price of labour, and to the causes which regulate it in an infant country; to the influence which Agriculture exerts on commerce, manufactures, mines and fisheries; and in fine to every thing which may be suggested either by the reflection of my own mind, or the hints of my correspondents. I shall exclude nothing here which may be directly or indirectly conductive to the revival of industry enlightened by intelligence, or which may lend an impulse to the progressive advancement of the province.

Under the second part I shall introduce a variety of observations on the present state of our live stock—on the comparative advantages of employing horses or oxen in labour—on the profits of appropriating the rude produce of the farm and dairy to the fattening of black cattle or hogs—on the best modes of breeding and rearing the different animals,—on the treatment of sheep, and the necessity of crossing and improving our breed by some new species: but the particular plan of arrangement I must defer in the mean while, and destine this day's paper to the first division of my subject, which shall occupy me for the next three or four months, and engross my undivided attention. It is on this first branch chiefly that I now request communications; for if the fears of my confidants be realized, who predict to me the total silence of all men on agricultural affairs, and blast every rising hope by their withering forebodings, it will be high time for me, at the termination of these my first labours, to withdraw from public notice, to repine in secret at the miscarriage of my prospects, and in melancholy mood to brood over the desolate and forlorn fate of Nova-Scotia. Should such a total and invincible apathy benumb our faculties, it is vain to shut our eyes on our coming poverty. The decay of wealth, since the ratification of the peace, has been rapid and beyond example. The imports of American produce alone would have been quite sufficient to ruin our currency, and account for the declension of trade, although we had met with no calamity peculiar to ourselves. We cannot continue for a series of years to purchase thus liberally from a foreign country; and unless we elicit and improve our resources, nothing remains for us but a "fearful looking for of judgment."

In the first part I shall treat of the general principles of vegetation and tillage, and shall divide it into seven Sections.

Section first—I shall throw out some observations on climate and its effects on vegetation, and inquire into the usual doctrine held here, of the unfitness of ours to perfect and ripen the bread corns. This will be highly necessary in the outset: for if it be true, that our climate is incapable of rearing wheat, rye, oats, and barley, (to say nothing of the plants cultivated for their roots,) it would be the extreme of folly to

amuse my readers with gaudy hopes, which, like the unsubstantial bubbles of the schoolboy, may flit before us in airy brilliancy, but must melt and vanish at the touch. In what manner a proposition so unstable in principle, and contradicted by every year's experience, should have grown up amongst us into the dignity of an axiom, and be received almost without dissent, I shall not pretend to determine; but sensible I am that it cannot stand the test of examination, and will be found equally groundless and mischievous.

Section second—I shall explain the purposes which the soil serves in the growth of plants:—its different kinds and distinctive properties as laid on the surface of the earth by the hand of Nature—and the remedies to be applied by the husbandman to correct its defects, and improve its natural untoward qualities.

Section third—I shall turn my attention to the use of the different agricultural instruments in preparing the ground for vegetable production. Here I shall be led to describe the various sorts of ploughs, of harrows, and of rollers; also the cultivator, the sowing machine, and the curious implements of the horse-hoe husbandry. On this head I shall aim principally to fix the eye of the Farmer on the subserviency of the different machines to pulverize and meliorate the soil, and the fitness of each to accomplish this purpose; and I shall only give him a very slight glance of their construction and the composition of their parts. This belongs more to the carpenter than to the ploughman; although in books of Agriculture much learned labour has been expended, and that usefully, on plates and descriptions.

Section fourth—I shall treat of Manures. These naturally divide themselves into two classes,—the *animal* and *vegetable manures*, which go more immediately and in greater abundance towards the nutriment of plants; and the *fossil* or *mineral*, which assist the process of nature and the dissolving action of the soil, in reducing the former into their chemical and elementary substances, as well as contribute, in small quantities, towards the formation of the vegetable fibre. Under the first, I shall describe the characteristic properties of the different kinds; the best modes of preparing, augmenting, and applying them to use; the prevalent faults on this head which have fallen within my observation throughout the province; and the artificial means which may be recurred to for the purpose of converting inert vegetable matter in the form of composts into active and valuable manures. Under the second class, I shall explain the nature and supposed agency of lime, of shell or pit marl, of sea coal ashes, of gypsum, of alkalies and of several saline compounds.

Section fifth—I shall descant on the natural hinderances in the soil, which are preventive of tillage, and which must be removed by human exertion to make way for the plough. This will lead to an estimate of the expense of cutting down the forest, of chopping and burning the timber, and of ultimately outrooting the trunks to clear the land. A great deal of practical intelligence may be conveyed to Agricola before he can reach this stage of the discussion; and in a

country, where these operations are daily going forward, the means of information are easily attained. I shall say a few words on the inequalities which are obstructive of aration ; and likewise on the necessity of removing cumbrous stones, and of draining superfluous moisture.

Section sixth—I shall explain the different Agricultural operations, and their utility in preparing the earth, and assisting the growth of vegetables. This subdivision will comprehend ploughing, harrowing, rolling, drilling, sowing and summer-fallowing, with other business of minor importance, but conducing to the same ends. I shall aim here at giving distinct ideas of these operations, which constitute the very essence of farming; and I shall endeavour to rectify the errors which exist in common practice. On the right and judicious performance of these labours depend the ultimate success of improvements, the abundance of crops, and the progressive melioration of the soil.

Section seventh—I shall enumerate and treat of the different plants and vegetables, which are reared for the use of man and the other animals. The preceding sections are all preparatory to this capital object: and hence I shall dilate on the different kinds of crops ; the soils most suited to each ; the most approved methods of cultivating them ; and the new plants, which may be introduced here with incalculable advantage. I shall then proceed to the Rotation of Crops adapted to particular soils, and illustrate the practice of other countries in this important branch of husbandry.

These various topics will exhaust whatever I can advance on the general principles of vegetation and tillage: and as they will occupy me till the end of the year in a weekly communication, my readers will have leisure to survey the subject in its dependances and relations, and to understand the fundamental principles of Agriculture, considered as a science. I shall intermix my reasoning with practical details gathered from my own observation ; and I cannot but entertain a hope, that many correspondents will assist me with the fruits of their experience, and support an undertaking, from which I am to reap no pecuniary benefit, and which threatens, from its uninteresting and dry researches, and from the little notice it has hitherto awakened, to drop still-born from the press. It may, perhaps, turn out a misapplication of my leisure hours ; but it is an honest and upright attempt to stir the public attention to know and estimate our true interests: and there must be many men of liberal minds both in Halifax and the Country, who will cheerfully lend their services, and extend their patronage to a project, which promises to construct our future prosperity on the solid and permanent basis of Agricultural improvement.

Halifax, August 18th, 1818.

No. 6.

ON CLIMATE.

NOTHING affected philosophers with so much surprise, on the discovery of America, as the different laws to which it was subject with respect to the distribution of heat and cold. When they compared any portion of the new continent, with Europe or Asia lying under the same degree of latitude, they were struck with a remarkable dissimilarity of climate, and found, on the one hand, that the rigours of the frigid zone extended far into those regions, which belonged to the temperate from their geographical position; and, on the other, that the heats of the Tropics were there much more tolerable than on the opposite coasts of Africa. These unusual appearances led to a variety of theories and conjectures. *Acosta first, and after him M. de Buffon attempted to explain them by the agency of the winds; and the latter gave full scope to his amazing powers of description, and exhausted all his eloquence, in embellishing and placing this hypothesis in the most convincing light. This view, so far as it is applicable to the torrid zone, may be admitted with some slight exceptions; for the trade winds, which parch the African negro, and are inflamed with the fiery particles of the desert, are cooled down in their passage across the Atlantic, and fan, like a refreshing gale, the shores of Guayana and the Brazils: but when we ascend to the northern latitudes, this theory of the winds becomes a wild chimera of the brain, and we are compelled to seek for new and adequate causes to account for the phenomena. Whatever these may be, the fact is indisputable, that throughout the whole extent of this continent cold predominates, and that our winters are both chilled with keener frosts and protracted to a more advanced period of the year. The snows here, in the latitudes corresponding to those of Spain, France and Italy, seldom dissolve till April, and for several months before, they cover the ground to a great depth; while too, the vernal blush of Spring is of short duration, and almost instantaneously lost in the ruddy and full blaze of summer.

It is, notwithstanding, unquestionable, that were it not for the operation of some counteracting causes, all places, at an equal distance from the Equator, would be subjected to the same degree of temperature. The Sun,—the prime distributor of heat—sends forth his rays according to fixed and unalterable laws, impartially to sustain and cheer vegetable Nature under the same parallels; and, accordingly, it is found, that climate, when all other things are equal, is determined exactly by relative position. Although here we are much more under the dominion of cold than in Europe, it arises from the peculiar state of the country, and not from any change in the action of the solar influence. Were these disturbing causes removed, Nova-Scotia would enjoy a climate, more friendly to vegetation, one capable of yielding the richer productions and the more luscious fruits.

These counteracting causes have, by the common consent of scientific inquirers, been reduced to Three—which I shall examine in order, and in reference to this Province.

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* Robertson's History of America, note xxxi.

1. The elevation of any country above the level of the sea affects its climate. Without entering at present into any learned philosophical account of this phenomenon, it may be merely necessary to state and illustrate the fact. It is well known to travellers, and has been by them sufficiently narrated, that in ascending lofty mountains, the cold increases in proportion to the height. At the bottom although they lanquish under the fervours of a sultry sun, they breathe a purer and more temperate air as they rise, till they at last reach the region of perpetual frost. The same has been felt by all those who have ventured to great heights in balloons; and the principal sufferings, to which they have been exposed in these aerial flights, have been inflicted by the piercing intensity of the cold, although their bodies were basking at the moment in the unclouded splendour of sunbeams. Hence it is, that all the peaks of the high mountainous chains are crowned with everlasting snows, such as the Pyrenees, the Alps, the mountains of Thibet; as well as the Andes which range within the tropics. The lofty Pichincha in the vicinity of Quito lying immediately under the line, and which by-the-by is inferior in elevation to other points of the Andes, has been described in all its horrid features by the mathematicians, sent jointly by the French and Spanish Monarchs, to measure there an arc of the meridian, by which to determine the figure of the earth. Their privations from the cold, amid this savage scene of tempests and eternal snows exceed belief, and establish beyond all controversy the position—that at a certain height above the level of the sea which is fixed by them at 2,434 fathoms or 14,600 feet, there reigns under the equinoctial an unmitigated and undissolving frost. In the temperate zone, the height at which snow melts is lower in proportion to the latitude; and on Ætna it may be quoted at about 10,000 feet, although on this head there are considerable discrepancies in the accounts of different authors. Indeed this celebrated mountain which, according to Brydone and Sir Wm. Hamilton, does not exceed two miles in perpendicular height, is a decisive proof in favour of the general doctrine, and contains on its sides an epitome of all the climates in the habitable globe. At the foot, the vine and the olive flourish most luxuriantly; in the middle grow the beech, the chestnut and the pine tree which, as you ascend, become gradually more stunted in their growth, till vegetation degenerates into the small and sickly shrubs of a Lapland climate; and the top is hid in a frozen mantle of ice. Standing on the peak and looking downwards, the eye distinguishes three different regions: that of snow, where is to be seen no trace of vegetation; that of forest, which surrounds the whole mountain with a zone of the most beautiful green; and the lower, covered with hamlets, vineyards and groves.

This same law prevails in countries distinguished by no uncommon elevation. In the south of France the summits of their high ranges, as the mountains of Auvergne, although unsuitable for the culture of the vine and of maize, abound in corn; and in Great Britain, particularly in the northern parts, the crops ripen according to their elevation above the sea. The low lying lands are more early than bleak situations in mountainous tracts, and the harvest is always finished in the former,

before it has begun in the latter.† Many of the chains, which intersect both England and Scotland, are too high for cultivation, and although the soil be excellent, oats, the hardiest of the farinaceous corns, have been often tried, but seldom come to maturity. All land in Britain, placed about 1500 feet above the level of the ocean, must be appropriated exclusively to pasturage.

Under the guidance of these facts and observations, when we turn our eye to Nova-Scotia, we must be convinced that her elevation is no obstacle to her agricultural capabilities. The whole country may be considered as a level, swelling gently into hills and dales, sufficiently diversified to delight the sight by picturesque scenery, but nowhere rising into the rude magnificence of rocks and mountains. There is no summit of commanding sublimity from which to take in any extensive range of landscape: and to this cause may be attributed, in a great measure, the dulness of our public roads. The traveller is constantly buried among trees, and he can seldom gain an eminence from which to descry objects at a distance. On the whole way to Pictou, Mount Tom is the only exception: and although on the other great road, there be some fine views at Windsor, at Horton, at Cornwallis, and at Annapolis, from some high points which command the rich marshes below, there is no rising ground throughout this extent of country, which, if cleared of the timber, would refuse to reward the toils of the husbandman. In coasting along our shores, the same regularity of outline is everywhere perceptible. No lofty peaks strike the eye with the meagre image of sterility, but it is universally saluted and charmed with the waving line of beauty, drawn on the top of the wild and unfelled wilderness. Our whole surface is so near the level of the sea, as to be capable, in its most elevated ridges, of ripening in ordinary seasons the common sorts of corn.

2. The relative position of any country with respect to land or water influences also its climate. The temperature of an extensive continent, and of an island or peninsula is very different under the same parallel of latitude; and this depends on the nature of their surface, and the expansive power of heat. When the ocean is exposed to extreme chilliness, its superficial waters become specifically heavier, sink downward, and are instantly replaced by what is warmer from below. When these are cooled in their turn, they likewise descend, and a

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†In the Report of Yorkshire presented to the Board of Agriculture I find this doctrine illustrated at some length.

"The highest of these hills in the North Riding is about 1,444 feet above the level of the tide, an altitude which between latitude 45° and 55° is greatly above that in which grain of any kind will ripen. I have frequently observed on these hills, that where grain is sown at an elevation of about 600 feet, the crop becomes extremely uncertain; that may be reckoned the greatest height at which wheat will grow, with any chance of repaying the husbandman for his labor, and there the grain will prove very light, and about a month later in ripening than if sown at the foot of the hills; between that and 800 feet may be reckoned the maximum of elevation for any other grain; between 600 and 800 feet, in backward seasons the produce will be little worth, and sometimes not approach maturity; and in other seasons it may be late in October before the ground may be cleared; and frequently before that period, heavy showers of snow will have fallen, and sometimes while the crop may be still standing; such showers the people who inhabit the dales of these moorlands always expect, and in their expectation are rarely deceived, during harvest. But in speaking of these heights, we must not look for mathematical accuracy: aspect and soil will make considerable difference, for which allowances must be made; a sheltered, warm situation may hasten vegetation, and bring a crop to proper maturity at an height greater than the above; or a warm dry soil, may have the same effect.' —Marshall's Review, vol. I, p. 426.

similar alteration takes place on the surface. The sea by this process continually gives out heat, and mitigates the severity of the air, until it be frozen at the top, which puts a stop to these successive changes. The surface of the earth, on the other hand, has no means of escape from the action of cold; and hence whenever subjected to its rigour, it is buried under an accumulation of ice and snow. But the sea has not only the power of resisting much better than land the keenest frost, but owing to its transparency and ceaseless agitation, it is heated with much greater difficulty. No exposure to a tropical sun ever raises the temperature of the ocean in any degree like that, which is felt on the surface of the ground; and hence in sultry weather bathing is an universal relief to our exhausted and overpowered sensations. We rush into the cooling stream, or plunge into the shallows of the deep, to escape the uneasiness, and shake off the languors of a burning atmosphere. In the same parallel of latitude, the heat at sea is never so oppressive as on shore; which can only be accounted for by the waters absorbing the fiery ardours, with which the air is impregnated.

From these causes it is, that insular situations are much cooler in summer, and warmer in winter, than those placed in the midst of vast continents. The West-India Islands are far more tolerable than the central parts either of Africa or South America, and the frosts in England are not nearly so intense as in corresponding places on the continent. Every spot on the habitable globe, which is on all sides encompassed by the ocean, enjoys a proportionable improvement of its temperature; and Nova-Scotia, on that account, washed on the one side by the Bay of Fundy, and on the other, by the Atlantic and the Gulf of St. Lawrence, bids fair, at no distant period, to reap the full benefits of her peninsular position. She is more commodiously situated for a milder winter, than either New-Brunswick or the Canadas, and even now the cold which reigns here is not half so rigorous, as on the banks of the Ontario and Lake Huron.

The last circumstance, which I shall notice, as affecting climate is the state of cultivation. This is the principal and most powerful of all the causes, which disturb the regular distribution of heat and cold, and as it operates here with unchecked force, I shall for that reason in my next give it a full and elaborate consideration.

Halifax, August 24, 1818.

TO CORRESPONDENTS.

AGRICOLA is gratified with Mr. Fleigher's attention, and shall avail himself of the benefits to be reaped from his mite. Humphrey's Gleanings will be acceptable, and both in due time shall be returned.

TO THES——from the River Philip, Agricola is indebted for the expression of his good will, and shall gladly receive any practical information regarding the husbandry to be adopted on different soils, or other rural matters which he may deem of importance, and which have fallen within his experience.

No. 7.

ON CLIMATE.

MAN in his individual capacity is a weak and evanescent being. The effects of his power are confined to the small portion of matter on which he acts: and the physical laws of the universe are beyond his control. Such is his feebleness in fact, when contrasted with their mighty operations, that he seems rather subjected to their agency, than capable of ruling or directing them. Viewed in his collective capacity, his power swells into importance, and causes effects, which, while they astonish the imagination, gratify his vanity; and in nothing are they so apparent as in his having cleared and embellished the earth, that he might render it the source of his subsistence, the place of his residence, and the theatre of his glory. On it he has levelled the mountains, and filled up the vallies; he has subdued the wilderness, and tamed its savage inhabitants; he has constructed canals, aqueducts, and bridges; he has piled up the pyramid and pointed the obelisk; he has reared monasteries, villages and cities; and although he could not resist and struggle against the laws of the material world, he has rendered them subservient to his use. Indeed, without his presiding industry these laws are apt to run riot, and waste themselves in a useless and cumbersome profusion. The trees of the forest thicken and imbower, till the face of day is hidden from his sight: the brambles and shrubs entwine on the surface, and present to him an almost impervious barrier; the waters stagnate into marshes, at once destroying the salubrity of the air and the fertility of the ground; and the useful plants are scattered at random, spring up by the side of noxious weeds, and with difficulty are collected and propagated for the convenience of social life. Such is the picture of all rude countries, not inhabited by men, long and considerably advanced in arts and industry.

The changes which are effected on the face of the globe by the plastic hand of human application pursued through a succession of ages and generations, are much more wonderful than we are apt to imagine. An old settled country, smiling in all its richness and verdure of corn fields and meadows, has very little resemblance to its original state either in its geographical features, or in its climate. The [1]Hercynian forest, which reached from the source of the Danube along its left bank to an immeasurable and unknown distance, traversing the whole of Germany till it touched the Euxine, and then starting off and plunging

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(1) Hujus Hercyniæ silvæ, quæ supra demonstrata est, latitudo ix dierum iter expedito patet. Non enim aliter finiri potest; neque mensuras itinerum noverunt. Oritur ab Helvetiorum, et Nemetum, et Rauracorum finibus: rectaque fluminis Danubii regione, pertinet ad fines Dacorum et Anartium. Hinc se flectit sinistrorsum, diversis a flumine regionibus; multarumque gentium fines propter magnitudinem attingit; neque quisquam est hujus Germaniæ, qui se aut adisse ad initium ejus silvæ dicat, quum dierum iter LX processerit; aut quo ex loco oriatur, acceperit. Cæsar's Gallic war. Lib. VI ch. XXIII.

into the wilds of Siberia, has not left one trace of its limits except on the page of history; and the [2]Ardenbee which in the time of Augustus embraced France like a girdle, has been entirely cut down, with the exception of a few remaining patches at Thionville: and the ground which both overshaded, is now thickly studded with chateaus, hamlets and cities. I shall not, therefore, be able more effectually to fulfil the promise made last week, of demonstarting that the state of cultivation materially affects climate, than by appealing to history to prove, that in Europe and Asia a mighty alteration has been produced since the first authentic account of these countries. If we shall find on examination, that in those regions lying within the 40th and 50th degrees of North latitude, winter reigned with a severity now totally unknown, that fruits and plants in these days grow abundantly where they would not thrive 2000 years ago, we shall establish, beyond all controversy, the influence of cultivation upon climate.

Herodotus the father of history informs us, that on the north shores of the Black Sea, and round the ancient Palus Mæotis, the duration of winter was for eight months, during which the ground was entirely buried in snow; and that all the countries beyond this line were accounted uninhabitable. Ovid, who was banished to the banks of the Euxine, describes the severity of the weather as insupportable; and distinctly states, that he crossed the Black Sea upon the ice, and that he saw oxen and carriages frequently passing—a circumstance, which we would esteem fabulous, were it not confirmed by other concurrent facts and testimonies. The ancient historians unite in asserting, that all the lakes, marshes and rivers of Gaul, Germany, Thrace and Dacia were every winter frozen over to a great depth and presented a firm footing to the hordes of barbarians on which to rush down and pillage the southern provinces. Diodorus Siculus, Strabo, P. Mela, Seneca, Pliny, the naturalist, Herodian and Justin are unanimous in delineating these countries as of horrid feature, and under the dominion of ice and snow the greater half of the year. Their accounts are so inapplicable to these now fair regions of the earth that had they not specified the rivers and seas by name, we would have been mistrustful, and supposed them engaged in the description of the inhospitable climate of Lapland or Siberia. Virgil is so distinct on this head, and is, besides, an author in every body's hands, that it may be only necessary, in order to avoid all parade of Greek and Latin quotations, to rest the facts upon his simple attestation. He is contrasting the shepherd life on the plains of Lybia with what it is round the sea of Asoph, on the banks of the Danube, and at the foot of Rhodope—a mountain in Thrace,—places situated between the 40th and 48th degrees of latitude, and exactly corresponding with the parallel of Nova Scotia.

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(2) Ardenne was a common name expressive of a forest among the ancient Celtæ, but the largest and most widely extended, retained it by way of distinction. The one alluded to in the text has impressed this name on its site to the present day; and was so vast as to range for 500 miles across the country of Gaul.

(3) At non, qua Scythiæ gentes, Mæoticaque unda.
Turbidus et torquens flaventes Ister arenas:
Quaque redit medium Rhodope porrecta sub axem;
Illic clausa tenent stabulis armenta; neque ullæ
Aut herbæ campo apparent, aut arbore frondes:
Sed jacet aggeribus niveis informis, et alto
Terra gelu late, septemque ascurgit in ulnas:
Semper hyems, semper spirantes frigora Cauri.
Georgics. Book III, line 349.

He proceeds in the same passage to describe their manners and habits, and they will be found much more akin to those of the Esquimaux than to the European nations now occupying that delightful tract. "They live, he says, in caves dug deep in the ground, and clothe their bodies with skins and furs. They catch the deer, not with hounds let loose, nor with toils and nets, but sinking in the yielding snow and incapable of escape. Their garments stiffen on their backs, and the icicles hang from their beards; even the wine, which they drink, is distributed in frozen masses, and cut with their hatchets." Those, who are curious and versed in Latin, may consult Cæsar's Commentaries; and a crowd of facts, incidentally mentioned by that historian, will be found to corroborate the previous accounts. In his second expedition to Britain, he stopt in the midst of his conquests, that he might reimbark his army, and return to Gaul before the autumnal [4]equinox—so much dreaded was the approach of winter, and so hazardous the navigation, though at that early season of the year. At another time, when he attacked the Helvii, he crossed the mountains of Cevennes, in the south of France, which were covered with six feet of snow and esteemed impassable. His appearance before the enemy was quite unexpected, as they always thought themselves safe from invasion during the [5]depth of winter.

But this is not all —Climate is determined no less by the vegetable and animal productions, which are found in it, than by the unequivocal testimony of history. Columella, in the reign of Claudian, is the first writer, who speaks of the culture of the vine in Gaul; and he infers from this and other facts, that the climate of those days was ameliorating.[6] "I find that it is the conviction of many valuable writers," says he, "that the state of the atmosphere changes in a series of years: for Saserna, in those books which he has left us upon agriculture, concludes that the atmosphere has undergone some change, because certain districts which formerly were incapable of producing vines and olives on account of the severity of the winter, now begin to yield abundance of wine and oil, from the climate having become milder and warmer."

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(3) "But not so is the climate, where dwell the Scythian nations, where flow the waters of the Palus Mæotis, or the turbid Danube whirling along his yellow sands, or where Rhodope bends round stretched under the Polar axle. There the herds remain shut up in their stalls; for there are no herbs on the plain, nor leaves on the tree. The earth without form lies buried under a heap of ice and snow, which rise to the height of seven ells. There reign always winter and the north winds breathing frosts."

(4) Multos enim jam memorabiles auctores comperi persuasum haberi, longo ævi situ qualitatem cæli, statumque mutari; idque etiam non spernendus auctor rei rusticæ Saserna videtur accredidisse. Nam eo libro, quem de agricultura scripsum reliquit, mutatum cæli statum sic colligit, quod quæ regiones antea, propter hiemis assiduam violentiam, nullam stirpem vitis aut oleæ depositam custodire potuerint; nunc, mitigato jam et intepescente pristino rigore, largissimis olivitatibus, Liberique vindemius exuberent. Columella, Lib. 1. ch. 1.

(5) Cæsar's Gallic war, Lib. v. ch. XIX.

(6) Idem. Lib VII, ch VIII.

Diodorus Siculus and Tacitus agree that the intensity of congelation in Pannonia and Thrace, in Gaul and Germany, was such as to render doubtful the culture of vines and olives, and any kind of fruit trees; and that to preserve them during winter they covered up their roots with dung—a precaution now totally useless in the three first countries, and only practised in the northern parts of the last.

The animals too, which inhabited these parallels during the period now under review, clearly prove, not only the uncultivated state of the country but the severity of the climate. The [7] Elk, the Buffalo and the Unicorn were found in the Hercynian forest, and some are of opinion that the reindeer frequented this illimitable wilderness. [8] Pausanias the geographer expressly states, that in Thrace there were white bears and swine even in his day—animals which have now abandoned all the warmer climates of Europe, and retreated into the desolate and icy wastes of the arctic circle. These collected facts and concurrent testimonies will bear us out in the conclusion, that the whole country from Spain to India lying between the 40th and 50th parallels were about 2000 years ago nearly in the same situation with respect to climate as the corresponding places now are in North America.

The evidence on this subject becomes more distinct and incontrovertible, when we confine our views solely to Italy, unquestionably the best cultivated spot in that whole range at this early period. The Roman legions regularly went into winter quarters, because that season of the year presented an insuperable bar to military operations; and the [9] odes of Horace lead us to believe not only that the streets of Rome were filled with ice and snow, but that the surrounding country was so bound up with frost as to stop the labours of the plough. Virgil too in his Georgics everywhere alludes to the severity of the winter, prescribes precautions against its rigours, and casually drops some insulated facts of a most decisive character.

nam frigore mella
Cogit hyems, eademque calor liquefacta remittit.

I shall close this long and perhaps too learned and ostentatious dissertation by citing the authority of Juvenal in his 6th satire to prove the nature of an Indian frost. The Roman Matrons in obedience to the priests were obligated even in the depth of winter and early in the morning, to perform ablutions in the sacred waters of the Tyber, and for this purpose the ice had to be broken.

Hybernum fracta glacie descendet in amnem
Ter matutino Tyberi mergetur.

The Tyber nowadays is no more bound with such fetters than the Ganges or the Nile; and cannot furnish to the moderns such opportunities of showing their zeal and devotion.

These views, which I have exhibited of the ancient state of Europe and Asia, would be still further strengthened, could we only discover

(7) Vide Cæsar de bello Gallico, Liber 6th, 23, 24, 25.
(8) Ree's Cyclopædia—Climate.
(9) Vide Horatium passim. Liber I, Ode 4th, 9th, Liber 4th, Ode 12.

the physical causes, which are adequate to produce the immense change that has been effected. These are chiefly three in number, and require only a very brief illustration.

The extirpation of the forests and the draining of morasses give free scope to the influence of the solar rays. When a territory is shaded with a canopy of continuous trees, the leaves and the branches intercept the beams of the sun in their passage downward, and prevent them from communicating the heat felt in open situations. The superabundant moisture too with which the ground is soaked; the stagnant waters which are collected in the levels; and the marshes which are formed, not only rise in clouds and fogs to obscure the sky, but in reality cool down the natural heat of the earth. No operation can take place without the expense of caloric; and moist ground, on that very account, is always much colder than dry. Let any man, at this season, lay his hand upon the mould in his garden at midday, and thence pass quickly into the neighbouring woods, and there touch the ground steeped in sap, and overhung with tangled coppice, and he will be made sensible without farther argument of the vast difference which must exist, in the temperature of a cleared and cultivated region, and of a boundless and woody waste. The leaves when acted upon by the rays of the sun offer resistance from the principle of vegetable life, and perspire in proportion to the heat to which they are subjected. Not so the earth—its inert matter presents a sluggish and impassible surface, and imbibes that quantity of heat which streams from the noontide day. This heat of the ground sets in motion the nutritive juices, aids the process of putrefaction, awakens into life the vegetable kingdom, and, from its contact with the circumambient air, diffuses a kindly warmth throughout all nature. Conformably to these general views, we find that the frost continues long in the woods after it has disappeared in the open intervals; and that snows will be met with in sheltered recesses as late as the month of June. When our forests are cut down and the naked bosom of the earth bared to the heavens, we shall have no concealed magazines of ice, snow, and fogs to chill our atmosphere and blast the tender blossoms of the spring.

I observe further, that the very increase of population becomes a source of heat—man and all other creatures are so constituted as to preserve in their own bodies a mean temperature. The mechanism, by which this animal heat is evolved and sustained, is curious and instructive; but suffice it to state, that however cold the air which is inhaled, it is thrown back from the lungs considerably heated. Expiration in this way becomes a source of warmth even more than perspiration; and hence we can account for the glow which is felt on our entrance into a ball-room as well as into a stable. The denser a population in any country, the more of this animal heat must be created and set afloat. Not only man, but the irrational companions of his pleasure, and the victims of his table are constantly pouring into the atmosphere a stream of tepid air, which instantly mixes with and effects the general mass.

Further, the purpose of cookery, and the rigour of winter, occasion in a well-peopled country an immense number of fires to be constantly kept burning. These after warming the inner apartments, escape at the top of the chimnies, and expend chiefly their influence in the regions of the atmosphere. The heat which arises from such cities, as London, Paris, or Vienna, has a sensible effect on the country around, which is visible in winter in the quick melting of the snows. The hoar-frosts seldom fall on the houses and streets, although they are at a great distance whitening the mountain and the valley. This source of heat depended upon population must have now a powerful effect in tempering the climate of Europe, covered as it is in every direction with farm houses, villages and cities ; and little upon a province like this, whose whole inhabitants are often compressed in England upon a square acre.

I observe lastly, that the operations of Agriculture are themselves productive of heat. It is now pretty generally acknowledged, that the process of putrefaction is indispensable in order to change manures into the proper food of plants, and that vegetables as well as animals live upon one another. Whatever has once enjoyed life, and breathed either by lungs or leaves, may be reduced to its elementary principles, and in this way afford nutriment to succeeding races and tribes. The present order of things is but a system of composition and decomposition, subjected to regular laws, and turning round the same circle of vicissitude. But in the dissolution of all organized bodies, a quanity of heat is invariably disengaged ; and it is on this account that a farm-yard is perpetually emitting a warm vapour. This process of evolving heat is also constantly carrying on in the ground itself, when stored with lime and other manures, during the whole progress of vegetation. The new crop is living on the dissolution of former vegetables supplied to it in the shape of dung ; and as these are going into gradual decay, the soil warms with the caloric they give out. Hence in Northern climates, snow always disappears soonest on the richest lands ; and melts as it falls, on a dunghill in a state of active putrefaction.

These three causes, two of them the sources of an artificial heat distinct from that of the sun, seem perfectly sufficient to account for the mighty change, which the climate of Europe and Asia has undergone for the last 2000 years, and they will in time, (for they are already in operation) work here similar miracles.

Halifax, August 31, 1818.

TO CORRESPONDENTS.

AGRICOLA has received Humphrey's Gleanings with the following note :—

Mr. Fleigher's compliments to Agricola, hopes he will not readily relinquish the task, however arduous it may be, to convince the people of Nova-Scotia, that Agriculture is the parent and nurse of arts and commerce,—the principal source of a nation's prosperity ; and that a seminary for teaching the art of farming would confer much more happiness on them than multiplying Colleges for classical learning.

August 31st, 1818.

No. 8.

I SOUGHT in my last letter to establish the influence of cultivation in improving the climate of a country, by exhibiting from ancient authorities the actual coldness of Gaul, Germany, Scythia and Italy about 2000 years ago. This appeal to history, when so clear and circumstantial, opens for us the most agreeable anticipations; and proves to the satisfaction of every rational inquirer that the severity of our winters and the backwardness of our Springs arise not from physical causes of a permanent and unchangeable character, but from the rude and uncultivated state of these northern Provinces. Our rivers are now bound in the same icy fetters, which of old froze the Rhine and the Danube, the Poland and Tyber; and we ourselves are chilled by the same piercing winds, in which the Roman and the Gaul, the Scythian and the Saxon shivered. If, in the old world, cultivation has converted bleak and desolate solitudes into fruitful and delightful regions; in the new, we have just grounds to expect similar results from drawing off stagnant waters, from draining fens and morasses, and from the destruction of the forests. True; a long interval must elapse before these agreeable prospects can be realized. The progress of man in fertilizing and decorating the earth, which, as he inherits it from nature, opposes a thousand obstacles to be encountered and overcome, must of necessity be tardy. The construction of towns and cities, the formation of public roads and canals, the removal of all the natural obstructions in the soil; are the work of time, and in fact go on, step by step, in successive generations. The rude progenitors of all modern nations laid the basis of their present wealth and civilization; and the sweat of their brow became the fructifying principle of that agricultural plenty which has poured on their descendants. The rich meadows of France, and the verdant plains of England, within these last thousand years, stagnated in marshes; or were encumbered with brambles, and overshaded with forest trees. Their present value has been created by the vast and continued labour of centuries, which has been expended in their cultivation; and this easily accounts for the difference of price existing between lands in an old, and in a new country. In the former, the sum given, however great, seldom repays the labour and pains, which have been bestowed on them by past generations; and in the latter, they are of light estimation, because the hand of industry has not yet moulded and fashioned them into use. One cultivated acre in England is worth more than a thousand in the wilds of Nova-Scotia.

But although a full and complete assimilation of our climate to that of Europe and Asia must be placed from us at a vast distance in futurity, yet we are gradually and slowly approximating to that point; and in proportion to our assiduity and improvement, we will draw nearer and nearer to it yearly. In truth, our advances will be liable to fewer interruptions than those which were encountered in the old Continent, and will be much more rapid. Man was then savage and

illiterate. The Arts and Sciences, although cultivated with some care and success in Greece and Italy, were never diffused throughout the surrounding nations; the overthrow of the Roman Empire swept away the brilliant traces of ancient knowledge and learning; and a dark and portentous cloud in the middle ages blotted out the lights of the European hemisphere. Agriculture, with all her sister arts, languished amid this scene of desolation; and the course of improvement was not merely checked, but violently driven backward. We are placed in happier circumstances. Profiting by past experience, aided in our schemes by the discoveries and inventions of Europe, protected in our rights and privileges by the principles of liberty; pre-eminent in arms and military tactics over the wandering and barbarous tribes around us, we can fear no such mighty reverses; and the natural and powerful spring of bettering our condition must urge us onward with irresistible impulsion. Not many centuries will elapse, before this Province, in the natural order of things, will be wholly settled and peopled. Its climate, at every stage of this progress, will become gradually milder, till it attain that temperature which it is destined to enjoy from its geographical position; and which will cause the *vine* and the *olive* to shoot here in exuberance, and the Indian corn to come to regular perfection. This is no idle and fantastical theory, contrived to recommend the study and pursuit of Agriculture, and the erection of Agricultural Societies; but it is a sober conclusion deducible from facts, and supported by antiquity. In confirmation of it I ask, whether the effects of our present cultivation, scanty and imperfect as they are, be not already visible in a striking melioration. This simple fact, should it comport with the experience of our older settlers, and be established by their united voice, verifies and corroborates all my train of reasoning; and on their honest and impartial testimony I leave the question at issue. In old books of French Geography, Acadia is described as sterile and joyless in the utmost degree, as the region of perpetual fogs and frosts, and as of inhospitable and forbidding aspect. When it was granted in the reign of James the First, its winters were remarkable both for their length, and the intensity of the cold; and its summers were so short and precarious, that it was accounted a gift of the Crown, of but little value. Even in the year 1794 when Halifax was divided and apportioned, the features of the climate were harsh and rugged; and the old inhabitants here, who can recall the sensations of from 40 to 50 years ago, narrate, with a kind of touching pathos, their sufferings from the rigour of the weather, and descend to facts, which stamp and pourtray its character. They tell us, that in those days the snow generalty set in about November, and continued often till May; that the harbour was frozen over every winter at Halifax, and that waggons and oxen, horses and sleighs crossed it without the least danger of accident; that the peninsula was so deeply buried in snow, that the fences were overtopped, and no traces left of the inequalities of the ground—the whole being an even glassy surface without break or impediment—and that the winter was steady and invariable without any of the present alter-

nations of frost and thaw. Dr. Williamson is equally positive as to the increased temperature of the United States ; and *enumerates a variety of circumstances, which seem to strengthen the conclusion. The vine, the cucumber, the squash, and the pumpkin are continually creeping northward, and now produce abundance of fruit where formerly they vegetated sickly, and where nipped by untimely frosts.

Having at length attained this point in the inquiry, let us pause for a moment, and ask, What duties are obligatory on us—the inhabitants of this Province—if we really love the soil on which we tread, and endear it with the name of country? Our first great duty is to encourage Agriculture by the most liberal patronage and protection. This art, in every age and in every place, is the prime source of national prosperity and grandeur. Commerce, mines and fisheries languish without its fostering care and propelling impulse. The seasons themselves frown on a people who live in the midst of woods and morasses, and nature hides her charms from their sight: for these are only displayed in the verdant meadow and the winding valley, in the cultured hill and the planted and ornamental woodland. The rude and unchastened luxuriance of the forest can never be allied to the pleasing and wild attractions of rural scenery. It is cultivated, and cultivated only, that tempers the bitter and chilling blasts of winter, softens the gentle breathings of the zephyr, renders the heats of summer unstifling and salubrious, and crowns the year with the joyous and ample stores of autumn. Cultivation arrogates to itself a sort of omnipotence, controls the laws of nature, and stamps the character of climate.

But there is another duty of no less high and commanding import. Societies should be formed everywhere, to cherish a spirit of internal improvement, to create a demand for labour, and in this way to arrest and absorb the emigration from the old country, which, as things now are, merely touches at Halifax and hastens on to the States. We have lands enough to grant; we stand in need of hands to clear and cultivate them ; and as yet no public body has constituted itself into a Society, to take these strangers who land amongst us under their care and protection, to direct their views, and find for them suitable employment. We remain passive and unconcerned spectators, and suffer these opportunities of adding to our population, to pass away without a single effort at benefitting the Province. Every emigrant, who settles here as a farmer, is a public benefactor. He diminishes the extent of our forests; he necessarily brings to market some surplus produce, and lessens, to the amount of that produce, our dependance on the States ; he bears his share of the taxes, and throws funds into the hands of the Legislature to be laid out in the further extension of public roads ; by his cultivation he is correcting the severity of our winter ; and however

*Volume I, page 272, of the Transactions of the American Philosophical Society. He observes in this discussion "that when the extensive country of North America becomes entirely open, when its woods are cut down, and its plains cultivated, the severity of the winter cold will not only decrease, but the stifling unhealthful heat of summer will be moderated. The quantity of snow, ice and moisture is already evidently lessened ; and many plants, which could not be cultivated there formerly, now thrive and succeed."

trifling his individual influence on the general scale, he is truly softening the harsh features of our climate.

I come now to the last view which I shall take of this subject, namely, that admitting our climate from this period, should remain stationary, and not become more and more temperate from the further progress of cultivation, it is now fit, in its present state, for all the purposes of Agriculture, and the production of the farinaceous grains. As this is the point to which I have been all along tending, I shall devote my next paper to its consideration,—which becomes the more necessary from the prevalence of the opposite opinion.

I shall close my remarks now by recapitulating what I have advanced on climate, that the whole subject may be brought under the eye at one glance. I laid it down as a general position, that climate is determined primarily by distance from the Equator ; and that all places under the same parallels of latitude would enjoy the same temperature, were it not for the action of disturbing causes. These I pointed out to be:—first, *Elevation above the level of the sea*, which when applied to Nova-Scotia, exerted a very slender influence, as we have nowhere within our bounds any barren snow-capt mountains:—secondly, *to being wholly, or nearly encompassed with salt water*—which circumstance always improves climate by tempering the colds of winter, and moderating the hearts of summer ; and this throws the balance also in favour of this Province, from her peninsular situation : and lastly, *the existing state of cultivation.* This is the most powerful of the three disturbing causes ; and, accordingly, I took some pains to prove, that ancient Europe and Asia between the 40th and 50th degrees of latitude were as cold and inhospitable as America now is under the same parallels. I investigated the physical causes of this curious phenomenon, and traced them to the more direct and uninterrupted action of the solar rays on a cleared and cultivated soil ; to the animal heat of an extended population and the artificial heat of villages and cities ; and also to the chemical heat of putrefaction depending on agricultural operations. Under the influence of these same causes I have evinced in this day's letter, that our climate, since the first accounts of it, has been always improving ; and in my next I shall attempt to show that it has now reached such a pitch as to be perfectly capable of producing and perfecting all sorts of grain. It is not the inclemency of our sky, nor the barrenness of our soil, which lays us under the necessity of importing flour so largely from the States, but the want of active skill and persevering industry amongst ourselves.

Halifax, September 7, 1818.

No. 9.

AT the conclusion of my last letter, I wound up the long train of reasoning about climate by exculpating ours from the common imputations cast upon it; and stated, that neither the inclemency of our sky, nor the barrenness of our soil was the cause of our not raising a sufficiency of bread corn for the consumption of the Province. This position, which I know, contradicts a prevailing prejudice entertained on this head, well deserves a little consideration: for it would be vain to stimulate to improvement, unless we were satisfied that improvement is placed within our reach. If this country be destined by Nature for pasturage, and be unfriendly to the production of corn; or if the breeding of stock, as is now generally practised, be the best and most judicious employment of land, it would be a misapplication of industry to turn to tillage, or make any extraordinary efforts with the plough. We are doomed, in that case, by the very constitution of the elements to a scarcity of bread; and in place, therefore, of writhing under the yoke of foreign dependance, and exerting ourselves nobly to shake it off, we should continue to go on peaceably in the present system, and fortify our minds with becoming resignation for that abject state of poverty whither we are fast descending. It betrays a want of manly firmness, not to look the evils of our situation boldly in the face, to survey them in their worst aspect, and, if irremediable, to abide the issue with collected magnanimity. With most of my readers, who have followed my views with ordinary attention, I shall need but little argument to convince them, that this Province can never thrive so long as American produce is indispensable for the feeding of the population. Let any man, versed in trade, take his station at our wharves, and count the endless barrels of flour daily discharging there; and let him be told, that in exchange for all this provision we have neither manufactures, nor fish, nor the produce of mines to give as an equivalent, but are constrained to pay at least four-fifths of it in hard money; and he shall no longer wonder at the scarcity of dollars—at the dejected and squalid appearance of the lower orders in the capital—at the numberless complaints which assail his ear—at the increase of public charities—and at the languor of all mercantile activity. These, in fact, are the inseparable concomitants of the existing state of our Agriculture, and grow out of it in the natural order of things. It would be impossible to reverse this order, without abolishing the political laws of society. Can a country flourish which feeds not itself; and has nothing to barter for its bread that is the fruit of its own industry? Can the lower orders be either well fed, lodged or clothed in the absence of all manufacturing and agricultural enterprise? Or can trade be lively and animated, when we have a hand only to receive, and not another to give? Where are all our high-blown expectations about the reviving efficacy of the Free-Port Bill? Sobered down already into sad reality. We are just beginning to discover that *Trade* is a reciprocal exchange of commodities, and that no

nation can carry it on without holding some productions either of its soil or its industry, as the materials of commerce. Neither of these we possess in any quantity; and of course that boasted Bill will prove a dead letter, and mock us with unsubstantial hopes. It is on the internal resources of the country alone, that we must place our reliance; for all else will on trial be found vain and illusory. If our soil refuses to yield us the necessaries of life with the most careful cultivation, and if we must always repair to the States for our essential supplies, no contrivance of human wisdom can stay us from sinking, and our plaister rocks, our fisheries and our Free-Port Bill have not collectively sufficient buoyancy to keep our heads above the water. I am anxious to impress this great truth indelibly on the public mind, and I have taken occasion to recur to it more than once: "that while we continue to import flour and other produce on so large a scale, and have no equivalent to give for them except our circulating species, we are chaining ourselves down to degradation and penury, and with our own hands forging the fetters in which we are bound." I ask every man of business in Halifax, I ask every farmer who is in the practice of coming hither for the sale of his produce, if they have not experienced a progressive and increasing decay of money since the termination of the late war; and if the complaints of all classes have not kept pace with that decay. The sensible part of the community are now pretty generally agreed as to the cause of this sad and alarming posture of our internal affairs. The wealth, which was poured in upon the Province by the war, was the sole pillar of its prosperity, and served to sustain it in spite of our indolence and the total neglect of Agriculture. We could then afford to purchase flour from the Americans, because we could pay for it in the spoils of their own commerce, and that of the other belligerents, taken forcibly from them on the high seas. We gave them in exchange for the fruits of their Agriculture, the fruits not of our industry, but of British maritime courage and superiority. Peace, however, put an end to this traffic so advantageous for us; and we were laid under the necessity of seeking some valuable equivalent, other than powder and cannon shot, to give in barter for our supplies. Domestic manufactures we had none; the fish caught on our coasts were inadequate to furnish us with the rum, sugar and coffee we wanted, and we had recourse to Cape Breton and Newfoundland to complete our cargoes; our plaister was laid under legislative interdict; our lumber to them was useless; and nothing remained to pay for this flour but our ill-fated dollars. At first the drain on them was hardly perceptible; it soon however began to press on our attention, and it is now ominously threatening. Hence the hardness of the times, the decay of trade, and all the inveterate and formidable symptoms of approaching penury.

In what manner then are we to extricate ourselves from the labyrinth of difficulties in which we are involved? I see no way of escape, but in the extended and improved cultivation of our soil; and it is treachery to the Province to preach up its incapability to sustain the

population. It *must* ere long sustain them, else they emigrate or perish. We cannot continue much longer to buy bread with hard dollars, for they now exist not amongst us; and this is so much matter of acknowledged fact as to be above all contradiction. What few remain are sought after with an avidity that will soon command a premium, and which in some cases has been already given; and they now have almost disappeared from circulation. All circumstances thus combine to force us back on our own resources, and urge us to seek from our native territory that sustenance which we have hitherto drawn from abroad. And our territory will not be backward in giving us all we ask. Let us only proceed to cultivate it with skill and perseverance, and we shall soon meet plenty treading in the track of the plough. The heavens will smile propitious on our labours, and "the jocund harvest, laden with heavy ears, will shut the scene."

The corns, which Nature has obviously designed as the chief food of man and beast, require no great skill of management; and are, withal, plants of a firm and robust constitution. Like the grasses, to which they bear a strong affinity both in their habits and structure, they grow in all soils and situations, and unquestionably, in all climates of the temperate zone. They are so hardy as to vegetate, when the thermometer is only a little above the freezing point; and it is well known, that as plants they will stand the keenest frosts of winter. Either in the seed or in the blade, they are perfectly safe although the mercury be at zero; and after they have lain for months buried under a thick coating of snow, they greet us—as harbingers of Spring—with a refreshing and lively verdure. The grains, in short, without this hardness of temperament would have been totally incompetent to meet the wants of society; and man dared not have migrated to those high and frosty regions which skirt the Arctic circle, unless he had been attended by these trusty companions to his new and dreary habitation. They seem even to have the property of accommodating themselves to the climate, whither they are transported. When sewn under a genial sky, they vegetate with a richer luxuriance, but take longer time to perfect their seeds, as if endowed with a percipient sensibility; when carried again to a colder and less favourable climate, they quicken their growth, and hasten to an earlier maturity. The Indian corn is distinguished by the same peculiarity. If seed be brought to this Province from the States, the plants in the first year will with difficulty be ripened. If some of the more forward heads be saved and planted next season, the crop will both be more certain and earlier from becoming more inured to the climate; and in the third and succeeding years, it will be completely naturalized and easily come to perfection. It is owing to this singular property of the farinaceous corns, that we find among them such an immense variety; and that wheat—the most delicate of the culmiferous tribe—can grow and perfect itself in Siberia. There is a species of wheat in the neighbourhood of Archangel* which ripens in

*Travels in Russia in the years 1788 and 1789, translated from the French of Chanteau—vol. 2 under tho word Archangel.

six weeks—a surprising proof of the accommodating nature of this plant to climate; and at the above port vast quantities of grain are exported, which are brought down the Dwina, and raised on its banks—a river, whose whole course lies in about the 60th degree of north latitude. Wheat, rye, oats and barley are cultivated with great success along the coasts of the Baltic, and not only supply the inhabitants, but leave a surplus for exportation. The mean latitude of these countries may be reckoned about 55 degrees; and of course they are nearer the Pole than Nova-Scotia by 700 miles.

But in opposition to these facts, were there still any doubt about the genial friendliness of our climate for the production of corn, when contrasted with these colder latitudes in Europe, we can appeal to more decisive evidence, and to a new class of witnesses. †Indian corn will not ripen in the north of France, and is only admitted as an article of field husbandry in the middle and southern departments. In Great Britain during the most favourable seasons, it never comes to perfection in the open air, and is only seen as a rarity in the central division of the hot-house. It will not vegetate on the shores of the Baltic without the forcing aid of fire, and is treated there by the gardener as a curious exotic. Maize, however, comes yearly to perfection in Cornwallis, Horton, Falmouth and Windsor, beside many other places in the Province; and so much adapted is it to Hants and Kings counties, that several farmers cultivate it to the extent of from four to six acres, and regularly save their own seed. It may be laid down as a rule without exception on the face of the whole globe, that whatever climate is capable of perfecting maize, is more than capable of ripening all the other bread corns.

This is not the whole of the evidence. In Great Britain and Ireland, in Prussia and Denmark, in Sweden and European Russia, the squash and the pumpkin, the cucumber and the melon cannot be raised without the shelter of glasses; and although in the heat of summer they live in the open air, their fruit is neither very ripe nor abundant. In these countries they must be all sown in a hot-bed, protected from the early frosts with incessant care; and their culture is attended with infinite labour. Their seeds, as here, cannot be scattered carelessly in the earth; and their produce both in bulk and quantity, after much pains, falls vastly short of our spontaneous profusion. When we pass from the kitchen to the flower garden, new proofs of the superiority of our climate crowd on our notice. The ice plant, cockscombs, balsams and peppers cannot in England, far less in Prussia, Denmark and Sweden, be sown in the open borders; and yet here they thrive vigorously, and perfect their seeds. I could instance many more proofs drawn from the class of annuals alone, were I not afraid of trespassing on the patience of my readers, by multiplying facts in confirmation of a doctrine too firmly established to admit of farther doubt. The irresistible conclusion from the whole of these details settles the point at issue,

†Young's tour in France, vol. I, page 31.

that the climate of Nova-Scotia, such as it *now* exists, is superior, with regard to the genial influence and heat of its summers, to all the northern European kingdoms, and is much more capable of producing the farinaceous corns. Were the half of the labour expended on our fields, which toils and sweats in England; were our soil to be impregnated and warmed by the application of the same caustic manures; the whole face of things would undergo a sudden transmutation, and corn flow in upon us in ample abundance.

In accordance with these general views, I call upon farmers, in all parts of the Province, to come forward with their honest testimony, and declare whether it is the climate, or their own careless inattention, that accounts for our shameful and ruinous deficiency of bread corn. Who ever cleared the forest and was disappointed in his wheat crop? Who ever sewed his grain on land prepared by previous hoeing and manure, or on what is called in the country in good condition, that was not compensated for his labour? I except those calamities that befall our crops in particular seasons, either from premature frosts or the invasion of mice, both which are referable to our forests; for in all countries disasters have at times blighted the hopes of the year, but we are not more exposed to them than others in similar situations. I have seen wheat as strong and vigorous in Annapolis, in Cornwallis and Horton, on the Shubenacadie, and at Pictou, as ever grew in England or France. True, I have witnessed also very inferior crops; but on investigation I could always trace them to blind and wretched husbandry. Barley is the very fosterchild of Nova-Scotia; and I have heard farmers profess that with them it has not failed more than once in twenty years; and yet enough has not been raised for the ordinary purposes of brewing. Oats grow plentifully on our highest grounds: and just now wheat has been cut down, full and heavy eared, on the Ardoise mountains, which from their height are a fortnight more backward than the adjoining levels of Windsor and Falmouth. We want industry, not a propitious climate, to make us rich in agricultural produce.

I shall admit, that the length and intensity of our winters form a serious interruption to country work, from the earth being covered with snow; but it should be recollected, that in England there is no vegetation during the same period, and that the only advantage its inhabitants enjoy over us in this respect, arises merely from their then tilling and preparing the ground. For this, we have some atonement made in the mildness and duration of the autumn, which is extremely favourable to all sorts of rural operation, were our farmers only diligent to improve it by the unceasing motion of the plough. This should be spent, not in the idleness and dissipation of horseback, but in the assiduous and active labours of the field.

I ought now to make some observations on the common opinion entertained by many—that pasturage in a country like ours is *more profitable* than tillage—a position which I flatly deny, and which since the introduction of clover and the other artificial grasses, has been

contradicted by the experience of all Europe—but it would lead me too much out of my direct road to enter on this question, till it comes before me in its due place. Suffice it to state generally, that it is the plough which draws from the earth the treasures of vegetation, and renders it fourfold more prolific, even in grass, then when it is suffered to repose in sluggish inaction, and to yield its scanty and polluted herbage.

Halifax, September 14, 1818.

No. 10.

ON SOIL.

THE earth, with which the surface of our globe is covered, has been denominated soil or mould, because in it the powers of vegetation were supposed to reside. It is there that seeds germinate, and plants and trees grow. Hence in every age the first impressions of mankind led them to imagine, that the soil constituted the principal food of the vegetable kingdom; and philosophy was far advanced, before this conclusion, seemingly so plain and natural, was the subject of dispute. In the progress of chemical discovery, the surface of the earth was detected to be, not a simple body possessing uniform properties, and giving similar results; but a compound of various, and I was going to say, heterogeneous materials; and these mixed up in all varieties of combination. It became then a question of nice discussion, whether all or only some of the component parts went to the nourishment of plants; and in the controversy, first one, then another, and at last the whole were discarded from this honourable and useful function. Water was next exalted to this office, and many curious experiments have been detailed to prove that this universal fluid was the grand agent employed by Nature in supporting the vegetable tribes. Van Helmont, in the beginning of the seventeenth century, adduced an experiment ingenious enough, and seemingly conclusive, which went to establish, that all the vegetable products were capable of being derived from it; and his results served, more or less, to mould the general opinion, till the real composition of water burst on the world from the labours of Mr. Cavendish. Hydrogene and oxygene —its constituent parts—were found inadequate to account for the presence of the other simple bodies yielded by plants on analysis; and thus mankind were forced to rectify the doctrines of an imperfect philosophy. Lord Kames is among the most distinguished, who adopted in their agricultural writings, this whimsical theory: and although he labours hard to establish it, he frequently deviates from his own principles, from that prompt and innate obedience which his honest mind paid to facts and experiments. Though convinced, after a careful examination of all the phenomena tending to elucidate the theory of the food of plants, that moisture formed that inexhaustible supply which produced the immense quantity of corn annually raised from the earth; and that the chief property of a fertile soil lay in its capacity of resisting the effects of drought, and retaining for a long time the rains and dews which fell on it from above: still he could not shut his eyes on the manifest agency of the other powers of nature, in aiding and accomplishing the great work of vegetation. He seems sufficiently sensible of the influence of air, and instances several plants—such as the house-leek, the hot-house sedum that is never watered, the varieties of wall-flower that delight to station themselves on the mouldering ruins of ancient buildings—all of which must derive their main subsistence

* Tull and Duhamel were both of this opinion.

from the aerial fluid with which they are surrounded. Nor does he exclude the operation of the sun, whose rays impart that *green* colour, which is the universal livery of the vegetable creation, and is essential to the health and development of the different species that abound in every region of the globe. Notwithstanding all these explicit concessions, and others casually and more obscurely made, he discovers an unconquerable propensity to recur to his favourite hypothesis, and at every turn under-rates the efficacy of every thing else, not excepting dung and lime—which, according to his own account, he deferred applying to a sandy moor under a course of improvement; "*until he incorporated with it a quantity of soft spongy earth, that the field might be made to hold water." He adds: "Lord Bacon long ago gave his opinion, that for nourishing vegetables, water is almost all in all; and that the earth serves but to keep the plant upright, and to preserve it from too much heat or too much cold." Throughout the whole of the Gentleman Farmer, a book that will always be read with interest, His Lordship is solicitous to discover some principle of perpetual fertility, and accordingly his directions for improving soils proceed on the notion of making them retentive of moisture; and in this way he expected to attain the object of his search.

Other writers, either from an itch for novelty, or a love of strange hypothesis which uniformly disgraces science in all intricate investigations, would allow neither earth nor water to serve as the food of plants, but dragged from obscurity a new class of bodies to answer this necessary purpose. The †oily and saline juices contained in the soil, were supposed to be set in motion by the vivifying influence of the sun, to mount in the tubes of the stems and trunks, and thus to feed the vegetable from the first moment of it breaking from the seed, to the last stage of its maturity and decay. Amid such a medley of opinions, and these are only the principal entertained on this head, it must be obvious to most men, that philosophy has not yet brought to light, in the wide range of her discoveries, what is the *proper food* of plants; although some approximations have been made towards solving the difficulty, which are perfectly sufficient for the common purposes of life in the practice of Agriculture. It is now ascertained, that there are many points of resemblance between vegetable and animal existence: and that these two kingdoms of Nature are not separated by that wide partition which our fancied superiority placed between them. Plants, like animals, propagate their kind by a sexual intercourse, and although the male and female organs of generation are usually brought into contact and encircled in the bosom of the same flower, yet they often exist distinct, some times in separate flowers on the same stem as in the cucumber; and at others, on separate plants altogether as in hemp. It is acknowledged too, that as all animals swell in hulk, or in other words, enlarge their dimensions, by the circulation of the blood which

* Gentleman's Farmer, page 363.

† Gentleman's Farmer, page 349. Miller's Dictionary; Article Earth.

reaches the most distant corners of the system, and carries thither strength and nutriment; so vegetables are furnished with vessels, which open a passage for the sap that is constantly ascending from the ground, streaming through their stems and foot-stalks, and escaping by perspiration through the leaves. A sun-flower of ordinary size has been found to discharge in this way 1 lb. 14 oz. of water in the course of the twenty four hours, a quantity greatly superior to the consumption of a full grown man. Without descending to more points of comparison, I shall just notice, that both plants and animals require for their support and increase, *food*, *drink* and *air;* and as this is the most important analogy between them in our present inquiry, and will, besides, furnish a philosophical explanation of most of the practical rules to be afterwards laid down for the conduct of the farmer, it will be necessary for my readers to ground themselves in the rudiments of agricultural science.

It will be extremely difficult to write in familiar and perspicuous language on this part of my subject, especially considering that I am addressing a community supposed to be untaught, not only in the terms of chemistry, but in its rudest and simplest principles. It will be impossible, on this account, to avoid giving some technical definitions and illustrations, which are essentially necessary to the right understanding of those changes produced on bodies by the agency of the powerful solvents that are diffused throughout all nature, and that exercise a sovereign authority in vegetation. It is time, that the farmers in this Province should turn their attention a little to those chemical researches, which, for some years past, have been directing and enlightening the practice of Europe, and raising their profession from its prostrate condition to the rank and dignity of a science. I know no other branch of industry, in which so much philosophy can walk by the side of manual labour. It is because we have despised or neglected philosophy, that our fields are so unproductive; and that our wealthy merchants, who have retired from business, rather idle away existence than engage in what is esteemed an inglorious and unworthy pursuit. The savage never tills the ground; the unlettered boor just scratches its surface, and amidst a thousand blunders draws from it a scanty and precarious subsistence; it is the province of the scientific agriculturalist alone, to give it its utmost fertility; and by his mode of culture, the improvement of his instruments, and the application of stimulating manures, to call from it the richest and most luxuriant harvests.

I observe, first, that most substances, of which the material world is composed, are capable of existing in *three* distinct states, from the mere expansive energy of heat; called in philosophical composition, caloric. The first of these which is termed the solid, depends on the presence of a small quantity of caloric; when that quantity is increased, the body passes into the second state of fluidity; and by still further increasing the heat, it rises into vapour; and this is said to be the aerial, the aeriform, or the gaseous state. Almost all natural bodies are susceptible of existing from the action of caloric in these three modes;

and the only difference among them is, that some require less, and others a greater proportion of caloric to induce these changes. Water which usually exists in our atmosphere as a fluid, can fluctuate by a very slight alteration of the thermometer either into *solid* ice, or into *aeriform* vapour. All the metals exhibit similar phenomena. If solid, they melt by the application of fire into a fluid mass; and if that be carried to a given pitch of intensity, they fly off in fumes and assume the gaseous state. The solid earth is not exempt from the dominion of this universal law. Flint and sand when put in the furnace, dissolve into liquid glass; and if exposed to a powerful heat, they are dissipated in vapour and assume new aerial forms. True; chemists have not succeeded in exhibiting all substances in this threefold state of existence; for rock-crystal has never been made to pass into fusion by the most violent exposure to fire; yet this inability has arisen, not, it is thought, from this substance forming an exception to the general rule, but from the difficulty of concentrating heat sufficiently powerful to cause the change. It may be taking by my readers, as an established principle in chemistry, that when different portions of *caloric* enter into combination with bodies, they pass, according to the quantity, into the respective states of *solidity*, *fluidity* and *aeriform vapour*.

It is this property of caloric which is the grand cause of vegetation. On the return of Spring, the solar heat penetrates the soil and relieves the moisture or sap, which has been so long bound and prevented from circulating. The fluid, thus dissolved by the genial warmth, instantly obeys the laws of matter, and either by means of capillary attraction enters the roots and ascends the stems of plants, or by means of evaporation rises in light steams, which again descend in dews and rain, and thus shed a kindly and refreshing influence on all the vegetable tribes. The increase of temperature quickens the activity of those chemical changes; and hence the difference of climate from the more or less powerful effects of the sun. Both capillary attraction and evaporation are more rapid in proportion as the temperature is higher; and thus the sap, which is unquestionably the conducting channel of the principal food, flows through the organs, and deposits the vegetable fibre at a faster rate in a hot than in a cold country; while evaporation is going forward at an increased pace no less on the surface of the earth, in order to replenish the atmosphere with the additional and necessary quantity of aqueous fluid, than on the leaves of all vegetables, in order to carry off the superfluous parts of the sap, which have been brought thither by the accelerated capillary action. The increase of evaporation, in consequence of raising the heat, is a fact familiar to the most common observer; and it is in the power of any person, how little conversant soever with the doctrines of physical science, to satisfy himself, that fluids when subjected to heat, obey more promptly the law of capillary attraction. If two wine glasses of equal capacity are filled, the one with cold, the other with warm water, and if a hollow stalk of grass, bent into the form of a syphon, is plunged into each, the warm water will be sooner discharged than the cold: and this simple and beautiful

experiment clearly founds a distinction, as far as growth is concerned, not only between the different seasons of the year, but between the different parallels of latitude. No vegetation can take place during winter, because the sap, frozen into ice, cannot circulate nor stream through the living organs. Neither can it commence in Spring, till the solar beam has shot its dissolving and vivifying influence throughout all nature. Within the tropics, again, the ascent of fluids through the tubes is accelerated by the great heat; and this cause becomes less and less operative as we approach the poles; in consequence of which there is a gradual decay of activity in the vital principle of growth, until it is arrested altogether by the unchangeable frosts of the Arctic regions.

I observe, secondly, that the substances, about which Agriculture is employed, are all *compounds;* that is, they consist of elements into which they are capable of being resolved. Of this no farmer should be ignorant; and he ought to attain at least so much chemistry as to know the nature, the properties, and the combinations of those elements which are almost never at rest, but, from the operation of heat and of attraction, are going one constant round of composition and decomposition. *Water* and *air* are themselves not simple, but made up of aeriform fluids according to fixed proportions in the grand elaboratory of nature; and as they have no small share in the process of vegetation, their component parts should be familiar to him. In fact, he cannot understand the nature and use of those vulgar operations, which his hands are perpetually performing, nor perform them a right, until his mind be illuminated by a few glimpses of this science. I impose upon him no laborious study of deep chemical research; I only require, that he be exalted above the brute which tugs in harness and assists him in his labour, by such an insight into the principles of his practice, as will enable him to direct and preside over it with an eye of intellectual superiority. It is impossible for me in this place to give him all the knowledge, which is essential to a successful pursuit of his profession; because these letters being of a popular nature, and designed for ordinary readers, must not glare with any unnecessary display of learning. Notwithstanding this conviction and determination, so necessary is a moderate acquaintance with the rudiments of chemistry, for the proper understanding of this and the subsequent sections, that I am struck with the palpable impropriety of entering on the discussion of soil, till I have planted around me a few lights, to dispel the darkness, in which otherwise my papers would be involved.

All surrounding objects, how much soever diversified in magnitude, in form, or other sensible qualities, whether inorganic or invested with the powers of life, are capable of being reduced into a few simple substances, which have been called, by way of eminence, the "elements of matter." The progress of chemical analysis has, within the last few years, introduced considerable and important changes into the number and arrangement of these primary bodies. Some known substances, such as the fixed alkalies and the earths, which have all along been accounted simple and uncompounded, and which resisted with an un-

conquerable obstinacy the retort and the crucible, have yielded to the powerful action of the Voltaic battery; and have been successfully separated into their constituent parts. These recent discoveries have thrown a doubt into our arrangement of the elementary bodies, and it is more than probable that as yet we have not arrived at them; on which account the subjoined catalogue must be reckoned a mere annuciation of facts consistent with the best and most careful results of statical experiment.

The number of bodies entitled to be classed among the elements are 47 in all:—3 acidifying and solvent agents;—6 inflammable substances;—and 38 metals. To these, perhaps, should be added 3 more; caloric, light, and electricity, which by most philosophers are considered as peculiarly subtle fluids, and of course as preferring a well founded claim to be ranked among the others. It would be dangerous to raise them to this distinction, while so many men of splendid reputation have denied their substantiality and declared them to be only motions or vibrations of the particles of matter; and therefore, without deciding on this intricate question, I have omitted them in the present enumeration.

The three acidifying and solvent principles are oxygeue, chlorine and fluorine. The first of these has been long familiar to the chemist, and constitutes about one-fifth of our atmosphere. The second is the substance which has been latterly employed by the British manufacturer in bleaching, as it possesses the singular property of destroying all vegetable colours; and which has passed under the name of the oxymuriatic gas. United with hydrogene it forms the muriatic acid, whose composition has so long remained a secret. It is a permanent elastic fluid of a yellowish hue, and of a disagreeable smell; and so strong is its tendency to combination, that many of the metals take fire and burn in it spontaneously. The last is the principle of the fluoric acid, and can be obtained, combined with hydrogene, by applying heat to a mixture of sulphuric acid, and fluor, or as it is more commonly called, Derbyshire spar.

The six combustible bodies are hydrogene, azote, carbon, sulphur, phosphorus, and boron—the two first being gaseous, and the four last solid substances. All of them have been long known, and been fully described in chemical treatises, except the last, which is only lately discovered from the decomposition of the boracic acid.

The other thirty-eight bodies consist, first of all, of the twenty-seven perfect and imperfect metals, the knowledge of which, at least of many of them, has existed since the origin of history; and of the nine and two new metals, which constitute the respective basis of the earths, and of the fixed alkalies. These eleven have derived their names from the substances in which they have been found, by adding the termination *um;* and have been denominated barium, strontium, calcium, magnesium, silicum, aluminum, zirconum, glucinum, and ittrium from the corresponding earths; and potassium and sodium from potash and soda.

I shall next state, that agricultural chemistry is not conversant about all these elements, for the greater part of them have never been detected in the structure of plants, nor in the soil which is the seat of vegetation. It is not, therefore, essentially necessary, on the part of the agriculturist, to extend his inquiries unto all of them indiscriminately; but he may confine his attention to such as exert a conspicuous influence on the processes and phenomena connected with his profession. These, in ordinary cases, do not exceed fifteen in number: and an acquaintance with their more common properties and combinations, will suffice for the pursuit of such experiments, as the analysis of soils, of manures, and of plants, may require.

The elements which constitute the greatest part of organized vegetable matter are oxygene, hydrogene, and carbon, with, in some of the products, a little of azote. But in addition to these, chlorine, sulphur, phosphorus, calcium, magnesium, silicum, aluminum, potassium, and sodium, with small portions of iron and manganese, enter, either in their simpler or more complicated arrangements, into the fibre and texture of plants, or into the agents which operate on them.

These fifteen *elements, by the power of chemical attraction unite with each other into an immense variety of substances, and compose that harmonious and beautiful assemblage of living forms, which, by means of their roots, stems, leaves, and blossoms, weave the verdant and flowery carpet that spring extends beneath our feet, and that the summer heightens and decorates with the most glowing and animating tints. Before they pass into the more complex arrangement of plants, shrubs, and trees, they previously unite into the simpler elements of nature, and constitute water, air, acids, alkalies, and various salts. These latter again are acted upon by the powers of growth, and after entering with the sap into the system, assimilate to the organs, and assume the characters of life. Without engaging in any long exposition of these compounds, I shall make a few observations on water and air only, in respect of their pre-eminent importance.

I remark then, that *water*, although a fluid, is in reality compounded of two aeriform bodies—*hydrogene* and *oxygene;* that it is a very ordinary experiment to decompose it into these two gases—and from these again, to form water by passing the electric spark through them. The *air* too, which surrounds vegetables, and in which we breathe, is a compound of three aeriform fluids—of *oxygene* which is one of the elements of water, of *azote*, and of *carbonic acid.* Air is decomposed several ways,—by the process of vegetation, by combustion, and by the respiration of animals. When it is taken into the lungs, the oxygene is converted into carbonic acid whose base is separated from the animal by an †internal exhalent secretion, and is thrown back into

* See Sir Humphrey Davy's Elements of Agricultural Chemistry, page 58. In this treatise the learned author enumerates only twelve elements, the study of which is important to the agriculturist; but he has obviously omitted chlorine—an essential ingredient, according to his own premises, in salt—and potassium and sodium—the respective bases of the two fixed alkalies which are invariably found in terrestrial and marine vegetable productions.

† See Ellis on respiration.

the atmosphere. The disappearance, then, of oxygene in the expired air is easily and satisfactorily accounted for, by the whole quantity having been necessarily employed in the formation of the carbonic acid. By this conversion of the pure part of the air, two very remarkable changes are accomplished in the animal economy. First, a considerable portion of latent heat is set free, which enters into the blood, and keeps up the e an temperature of the body; and next, the superfluous carbonaceous matter, which would prove noxious to health, is expelled by the outflowing stream of respiration. Oxygene has been thus called vital or respirable air, being essential to the support of animal life; while the other elastic element has been denominated *azote*—a word of Greek origin—and which means "destructive of life." A mouse or frog, being placed in the latter, and excluded from the atmosphere, will in a short time die in violent convulsions. The carbonic acid, which only exists in a very small proportion in our atmosphere, is a compound of *carbon* and *oxygene*. Carbon is that light, black, brittle substance, which remains after the burning of wood, and is commonly known by the name of charcoal. It could be found last Sunday scattered in all parts of the town contiguous to the *destructive fire; having been carried up into the air by the force of the conflagration, and afterwards dropt at random. I saw innumerable specimens of it strewed in all directions. When combined with oxygene, it passes from the solid into the aeriform state, and constitutes carbonic acid—a gas of important influence in vegetation, and by some modern theorists supposed to form the chief food of plants.

Animals and vegetables are compounded of nearly the same elementary principles, which enter into their systems by the food, water and air they are constantly consuming, and which encourage their growth, and increase their bulk. Their organs of digestion and secretion, the ducts, vessels and tubes which pervade all parts of their structure, are no other than contrivances of divine chemical wisdom, to distribute, resolve and combine, in a endless variety of ways, these simple bodies, which I have been explaining under the uncouth names of Oxygene, Azote, Hydrogene and Carbonic acid. These, as it has been already stated, are not the *only* principles of animal and vegetable composition; but they hold a conspicuous place, and on that account merited a particular description. To such as which to push their researches farther, systems of chemistry, of which there are several of distinction, must be referred to; and besides these, every scientific farmer should consult Sir Humphrey Davy's Elements of Agricultural Chemistry delivered in a course of lectures before the Board of Agriculture, in London.

Plants and animals are either violently destroyed, or come to maturity and die. After death they submit to a new process called putrefacation, which is just the reverse of that which nature had em-

* This alludes to an event which happened at the time, when the old hull of a ship, which had been long used as a store on one of the wharves, accidentally caught fire and burned with great fury.

ployed in their formation and growth. The different elementary principles, which had united in their composition, are disengaged and escape from them, either in juices, or aeriform products, or an indissoluble residuum. These component parts, thus let loose from combination, remain not long inactive, but rush speedily into new compounds. The oxygene, which escapes from a decaying flower mixes with the air, and the next minute may perhaps enter the lungs of the man, who is bending over it in contemplative mood at the precariousness of its short-lived beauty. It is thus that all decomposing vegetable and animal substances serve the purpose of manures; because their elementary principles are dissolving, and separating from each other; and in this way, are prepared, by the wonderful and mysterious economy of nature, for feeding and sustaining the different orders of organized beings which are then enjoying existence.

I observe, in the next place, that the elementary substances which enter into the formation of bodies and are disengaged by their dissolution, are, as far as we know, imperishable; and that all the changes which take place, are in no case a *destruction* of matter, but only a *transformation*. This has been clearly established in the course of chemical investigation, and has been found to be invariable as far as analysis has proceeded. Let any fixed body be decomposed, and let the gases, into which it has resolved itself, be carefully collected in glass receivers and weighed; and they will be of the same value with that of the original compound. Nothing will be lost in the process, except from the clumsiness of the experimenter, or the imperfection of the instruments. When a heap of vegetable matter, therefore, is laid on the ground exposed to the action of the sun and air, and there allowed to putrify, it loses considerably in both its bulk and weight; but if the steams, or to use our new language, the gases, which arise from it had been preserved, their joint weight would have exactly balanced this deficiency. The ashes, too, which remain in the chimney, bear no sort of proportion either in weight or bulk to the logs consumed in forming them; because the amount of the whole aeriform fluids, which passed off in the shape of smoke, has been lost in the computation. These are familiar instances level to every capacity: but the nicety of chemical experiment has now analysed the greater part of compound bodies, and stated in decimal fractions the quantities of their integral parts. The practical use of this doctrine in preparing and augmenting manures, may be readily anticipated by the agriculturist, but shall be fully explained, when we approach that branch of the subject.

I observe, fourthly, that the dissolution of organized bodies may take place in two ways: either into animal existence, or into elementary decomposition. When butcher-meat in hot weather runs into a living mass of vermin, it is nothing more than a species of dissolution; and in particular situations animal and vegetable substances are extremely apt to exhibit this phenomenon:—but in my present letter I cannot pursue farther this subject. My next shall close my remarks on

chemical agriculture; and in the mean time I request my readers, who wish to follow me in the elucidation of the Synopsis, to spare no pains in fully understanding the previous facts and rudiments of the science. They are plain and simple, and to a scholar will seem somewhat of needless trifling; but as upon them rests the vast and solid fabric of husbandry, every practitioner should study and be impressed with their importance.

Halifax, September 22, 1818.

TO CORRESPONDENTS.

During the two last weeks my correspondents have multiplied upon me, and it is a pleasing consolation, and in some measure a reward of my humble efforts, to mark the progress of that excited attention, which these letters are awakening. Some of these communications are important in a practical point of view, a few are speculative, and many of them complimentary. To all those who have not received a private answer, I offer my public thanks; and I can assure them, that such approbation and proffered assistance are happy omens of our future prosperity. I see already the embryos of several Agricultural Societies, and I only wish that I may be able to conduct the discussion so as to sustain and propagate its growing interest. This will depend much on the information given me of a local and practical nature.

I am in possession of the respective letters and package sent me by Mr. Mortimer of Pictou, by the Reverend Doctor Cochran, by Mr. H. H. Cogswell and by the Honorable Mr. Jeffery.

In addition to the notices published from week to week to my correspondents, and which I shall subjoin to these letters, I mean to record the principal events as they occurred, which have distinguished the history of our agricultural progress. Although this may seem to the general reader a departure from the original plan, and an encroachment on the systematic and didactic tenor of the subject, yet it will be interesting to the inhabitants of this Province, for whom chiefly this volume has been sent to the press.

I shall take the present occasion to review shortly some steps which I had taken to arouse the public attention, which contributed in a signal manner both to awaken a lively interest in my success, and to multiply the number of my correspondents. After the appearance of the fifth letter, which sketched the outline and great division of the subject, I ordered 200 copies of that Synopsis to be struck off; and these I distributed over all parts of the province, by enclosing them under cover to the principal characters of influence, whom I deemed useful to my purpose. By this means they became acquainted with the mode in which I meant to conduct the investigation, and were prepared for giving me effectual assistance. From this correspondence they

soon began to account me a well known personage, though concealed under the signature of "Agricola," and, as my end was publicly and manifestly beneficial, to write me back freely, and without reserve. About this time the Governor—the Right Honorable Earl of Dalhousie—addressed me in a very flattering manner, praised my past efforts, and encouraged me to persevere. This opened new prospects; as it gave me the first patronage of the province; and I became sure of accomplishing my object, unless I should prove faithless to myself. Although no public notice was taken by me at the time of this distinguished and friendly intimation, yet it was eminently subservient to the attainment of my main design. His Lordship approved of my writings in his private circles, and those about his person and government scrupled not to enroll themselves among my correspondents. My rapid and unprecedented success is, in a great measure, attributable to this early attention paid to me by His Excellency. His first letter was dated September 28th, 1818, and directed to Agricola.

No. 11.

ON SOIL.

IN my last letter, before entering on Soil, Manures and the subject matter of the other sections, I found it absolutely necessary to make some introductory remarks on the Chemistry of Agriculture, in order, if possible, to direct the attention of Farmers to this branch of knowledge, which occupies so large a space in all modern publications, and supplies the fundamental principles by which to explain the practice of scientific agriculturists. Without some knowledge of this science, these books cannot be consulted with profit; and I earnestly impress on my readers the necessity of making themselves acquainted with its general doctrines. A very slight application will conquer the difficulty; and they will be rewarded by seeing in a new light the nature and tendancy of those common operations in which they are daily employed.

I observed, in the first place, that all bodies, from the action of heat, were capable of existing in three states—the solid, the fluid, and the gaseous or aeriform; I remarked, secondly, that the most of substances, which the farmer was constantly handling, were compounds, or consisted of simpler bodies into which they could be resolved; and that this resolution usually produced aeriform gases, of which the principal were oxygene, hydrogene, azote and carbonic acid; in the third place, I said that all changes in the material world, such as by burning, by putrefaction, or by other processes, merely reduced the bodies into their simple elements, and was in no case a destruction of matter; and, further, that the dissolution of organized bodies may take place two ways, either into animal existence or into elementary decomposition. In illustration of this last, I was going on to state: that butcher-meat, which is so apt, in warm weather, to run into a living mass, is an example of the first; and *that* identical meat, when taken into the stomach and digested for food, is an example of the second mode of dissolution. In the one, the component principles, in the very act of dissolving, combine anew and create, by nursing into life the ovaria of insects which penetrate by means inscrutable to mortal eye, those maggots which nestle and crawl on each other, in the most disgusting forms; in the other the preparations of roasting and boiling, the mastication of the teeth, and the solvent powers of the digestive organ reduces it into chyle and excrementitious matter, from both of which are elaborated new compounds. It is curious that we can dissolve animal fibre either the one way or the other at pleasure; and that, too, by the mere putrefactive power of the soil. In last July, a beef-ham, which had been cured the previous winter, and had since that time hung in the kitchen, became strongly tainted and unfit for the table. I cut it asunder, and perceived that close to the bone it had begun to corrupt into animal existence. From previous reading I was aware of the two sorts of dissolution, and formed the purpose of putting them to the test. The one piece on which the maggots had made greatest riot, I buried in the garden about the depth of two feet; the other about nine inches

from the surface. Two weeks afterwards I examined them and found that the animals on the first piece had all perished and disappeared, and that the meat itself was losing its consistence and assuming the whiteness and unctuous touch of fatty matter, The second piece, upon being turned up with the spade, was a hideous living mass. I restored them both to their respective positions, and covered up the holes with the same earth that had been dug out of them. Towards the end of August I took a second survey, that I might note the progress of my experiment. The piece deeply buried was nearly all wasted, and the flesh still remaining round the bone was sweet to the smell, and converted to something like white soap—without the vestige of a single animal either on it or in the ground. In the other near the surface were luxuriating myriads of vermin, mostly of the same size, and all of the same species. I again replaced them, and two days ago opened them up for the last time. The first piece had now entirely vanished, except the bone, and even it exhibited symptoms of decay; and the nest of vermin that came to life from the second had themselves submitted to the dissolvent powers of the soil; and all that remained of them was a blackish earth in which they had putrified and perished.

From this experiment I am justified in drawing the following conclusion: That the elementary substances which enter into the composition of animals and vegetables are nearly the same; and that their remains will give similar results. Hence it is that decomposing animal and vegetable bodies have been with equal success applied as manures; because both of them dissolve into the same primary elements.

The last general observation which I shall make on agricultural chemistry is, that the principle of combination among the elements of matter, as they are arranged by the powers of life in the vegetable structure, is entirely dissimilar to that which obtains in inorganic compounds, and is governed by different laws. These elements, when they are employed to form the various substances in the mineral kingdom, unite with each other in certain definite proportions; and these combinations are pretty accurately known, and, in many respects, are under the power of the chemist. In this class of bodies he can imitate the workings of nature, either by analyzing them and exhibiting their component parts; or again, by joining these parts and reproducing the original compounds. The sulphuric acid can be resolved into sulphur and oxygene; and these two elements can be, by the mere process of combustion, reunited into the acid. Our knowledge, in this case, is perfected by the application both of the analytical, and of the synthetical mode.

If hydrogene, which is the lightest of all known substances, be taken as the standard, or common measure, and be made to represent unity, or 1; all the other elements may be expressed by numbers, and the proportions, in which they enter into organic combinations, may be shown and distinctly conveyed by these numbers, or by some multiples of them. This law of definite proportion has not yet been thoroughly investigated; for the numbers representing some of the simple bodies,

notwithstanding the utmost patience and assiduity of modern inquiry, are still unknown; yet research has been prosecuted so far as to lay open a wonderful order and uniformity in the arrangement of the minute particles of matter. Thus; hydrogene, which is at the top of the scale, is represented by 1, oxygene by 15, chlorine by 67, azote by 26, carbon by 11.4, sulphur by 30, phosphorus by 20, potassium by 75, sodium by 88, calcium by 40, magnesium by 38, silicum by 31, aluminum by 33, iron by 103, and manganese by 177. These fifteen elements, which are concerned with the vegetable kingdom, unite in the proportions above stated, or in some simple multiples of them, whenever they rush into the forms of dead matter. For instance, potash, when free from all foreign admixture and consisting of the pure alkali, is composed of one dose of potassium 75, and one of oxygene 15, and its constitution may be represented by these numbers added together, $75+15=90$. Soda again, or the pure mineral alkali, contains one dose of sodium, and two of oxygen; $88+2\times15=30=118$.

Carbonic acid is composed of two proportions of oxygene, and one of carbon; and its constitution will be indicated by the numbers 41.4. Lime, on the other hand, is formed of one dose of calcium 40, and one of oxygene 15, making the sum total 55.

It is necessary here to go a step farther and inform the reader, that this beautiful law is so regular in its operation, that it directs the combination not only of the elements themselves, but also of their compounds. Limestone, as dug from the bowels of the earth, is a mixture of the two substances last named, and is composed of one proportion of the carbonic acid 55, and one of lime 41.4, and may be expressed therefore, by the number 96.4. If we resolve this gross amount into its elementary proportions, we shall find, that in a given piece of limestone there are 45 parts of oxygene, 11.4 of carbon, and 40 of the newly discovered metal, denominated calcium. And further, were the identical proportions of these three elements indicated by the above numbers again brought together, and exposed to heat under a proper degree of compression, in order to suppress the elasticity of the gaseous parts, somewhat similarly to the satisfactory and well conducted experiments of Sir James Hall* undertaken to verify certain principles assumed in the Huttonian theory of the earth. the whole would form anew into the carbonate of lime.

So singular and uniform is this law that, in the combinations of dead matter, no instance has been found of its violation, in the union either of the elements with each other, or of the substances which they form. For example: several of the metals can combine chemically with from one to four proportions of oxygene, and thus constitute oxides of different colours and properties; but in all these the vital air unites with the metallic base either in its numerical proportion 15, or in multiples of it; as 15, 30, 45, 60.

* Sir James Hall's account of a series of experiments, showing the effects of compression, in modifying the action of heat.

Water, which is undergoing constant changes, and entering into a multiplicity of bodies, is constituted of two proportions of hydrogene 2, and one of oxygene 15 ; so that its joint number is 17. When this universal fluid rushes into a hydrate, and chemically combines with any other substance, it follows the same law of definite proportion, and unites according to the numbers 17, 34, 51, 68 ; so that this doctrine, in the hands of a skilful and enterprising analyser, becomes a master-key to unlock the mysteries of the constitution of natural bodies.

But when we ascend from dead to living matter, from inorganic substances to the productions of the vegetable kingdom, the dominion of this law is no longer acknowledged ; and we are left to grope our way amid lights, that are incomparably more dim and imperfect. The organs of plants are fitted to perform functions that bear no sort of analogy to the powers of attraction and repulsion, of crystalline arrangement and galvanic decomposition. The vegetable products, either of a mucilaginous, saccharine, extractive, resinous or oily nature, are chiefly composed of carbon, oxygene, and hydrogene ; and, in a very small proportion, azote is blended with these others in albumen, gluten, gum elastic, and indigo. These four elements, by means of slight changes among themselves, constitute that variety of products detected in plants ; and although we can analyze all or the most of these products, and approximate nearly to a correct knowledge of their constitution, nevertheless it is beyond the ability of the first experimenter, and peradventure removed at an infinite distance from human skill, to combine these elementary principles anew, and produce the substances which the powers of vegetation can so easily generate. The philosopher can decompose and reproduce the acids, the alkalies, the metallic oxides, the salts, and all the innumerable fossils which constitute the terrestrial mass of matter : because the law of definite proportion acts by its own native energy through the endless changes, which these are undergoing : but no man, whatever may be his talent for deep research, how diligently soever he has interrogated Nature about her profoundest secrets, or whatever the store or complexity of his instruments, has yet been able, from the simple elements of matter, to create the compound products, which are found in the vegetable creation. Starch, sugar, wax, resin, gum, indigo have all hitherto been obtained from the process of vegetation, and have never successfully been imitated by art.

Yet after all, it is only in the assimilation of the nutriment to the organs, and in the conversion of the sap into the vegetable products, that the principle of vitality displays itself in this unaccountable and baffling manner ; for, in other respects, the phenomena of growth are, most of them, referable to the chemical laws of matter. The dissolution of manure into its elementary parts, the ascent of the sap by capillary attraction, the mixture of alimentary soluable matter with that sap, and its being impregnated with gases—either ammonia or carbonic acid—may be exemplified by the chemist, and a full representation of all the processes subjected to the senses. Still there is a point where the laws of attraction and repulsion end, and the functions of life begin : and

though we can trace and mimic Nature in the former, she eludes our bold and adventurous inquiries in the latter, and asserts, at the expense of all human intelligence and skill, the unsearchableness of her ways. The peculiar character which life impresses upon her productions—the mode by which the elements, by a diversity of their arrangement, are made to form the most different substances—the process, by which can be elaborated from the sap so many juices of dissimilar taste and virtue —and in one word, the way by which the vegetable is sustained and increased in bulk, are perhaps forever placed beyond the discovery of science.

After making these preliminary observations, I would remark that although it be not yet discovered to the satisfaction of naturalists, what is the proper food of vegetables, nor ascertained how many elementary principles are subservient to their aliment, nor how these principles are changed and consolidated into the woody fibre, we know enough to guide our practice, and are confirmed in it by a long and uncontradictory experience. The same obscurity hangs over the proper food of sentient beings; and we are equally puzzled, when we push our researches into the secret recesses of the animal economy, to find out the simple and original elements of its support and conservation. This difficulty, however unsurmountable, throws no bar in the way of our using that food, which has been found conducive to health; nor should our ignorance of the nutriment of plants oppose any obstacle to the application of those manures, the usefulness of which has been sanctioned by time and observation. I believe it would serve the purposes of philosophy much better, to lay aside this prying curiosity into the inscrutable works of Nature, and to govern our conduct by those facts which are plain and palpable. Since it is, therefore, undeniable that a wonderful and striking analogy holds between plants and animals, in the propagation of their kind, in their capacity of decomposing air and water, in their absorbent and secretory functions, and in the chemical elements of which they are composed, why may we not at once conclude, that in the nourishment of both there is a no less remarkable resemblance? Animals live upon flesh, fish, fowl and herbaceous substances; all these when deposited in the earth feed and invigorate the growing crops. Animals require water to replenish the exhausted juices: plants too languish, when deprived of this universal restorative. However rich the earth, in which the ornamental shrub is planted that decorates the parlour window, it droops when the necessary quantity of moisture is neglected to be poured into the flower-pot. Animals require air, and a suspension of breathing is followed by instantaneous death; this element is no less necessary for plants, and without it they sicken, decay and perish. The conclusion of the whole matter is, that plants feed on decaying animal and vegetable remains, and that, in addition, they must have, for the free exercise of their functions, a regular supply of water and air.

It is of less consequence to know in what manner putrid matter contributes to the support of the vegetable world, although *this* would

be curious, perhaps useful information; yet all agree that the effect is produced partly by chemical, and partly by vital processess, under the direction of the Great Preserver of the Universe. Hence in England inquiry has been set on foot to explore, if possible, those laws regarding the distribution of the minute particles of matter which are principally operative in the maintenance of vegetable life; but as yet no definite and positive result has been universally recognized; and the minds of men are still actively engaged in this great field of investigation and discovery. It would be unnecessary to lead my readers far in this perplexing path; and suffice it to state, that all the present experiments, which have been conducted with accuracy, seem to verge towards one point, and which on that account is gaining considerable credit, that carbon, oxygene, hydrogene and azote, with their combinations, form the principal ingredients in the sustentation of plants, and that these principles are introduced chiefly by the roots. However much this dictrine may coincide with the legitimate conclusions of science, I am inclined to believe, along with many enlightened agriculturists in Europe, that it has been a vain and unprofitable pursuit to waste so much time, and multiply so many experiments in the prosecution of this object; for that plants are nourished, in a greater or less degree, by all those substances which are found in their composition, and which have been assimilated to the organs by the exercise of the vital functions. The roots spread in the soil, stretch in every direction, divide and subdivide into almost imperceptible ramifications, in order to collect the sap, which, holding in solution various matter, mounts into the stem, and, like the blood of animals, distributes through all parts the necessary nourishment. Water then is the first grand solvent acting on the decomposing substances in the soil, and which becoming impregnated with the gases, juices, and other soluble matter arising from corruption, carries these along with it through all its winding channels, and deposits them in its course by the action of the secretory vessels.

But although the putrefactive products, consisting principally of carbon, hydrogene, oxygene, azote, and their combinations, cannot but be regarded as eminently nutritive, and as what plants mainly depend on for support, yet we must not exclude other elements from the just rank they hold in this department of Nature. The four earths of which, as shall be afterwards explained, soil is composed, the various acids, the alkalies, the oxides of iron and manganese, and several saline compounds, all find their way, through the medium of the sap either suspended in it mechanically, or combined with it by chemical affinity, into the heart of the organised structure. I am not certain whether it be very correct, in point of language, to describe these as constituting part of the food, because they are detected in plants on incineration, and other methods of analysis, any more than it would be warrantable to call lime, sulphur, phosphorus, and a multiplicity of acids, constituent principles of animal food, on the simple ground of their being found in the bones and secretions of the body. Several substances can be in-

troduced by the sap which are in fact deleterious, and many may enter the same way, from their accidental presence in the soil, without producing any useful effect; so that the common doctrines of exalting whatever may be yielded on analysis into the pabulum of vegetation, is both questionable and dangerous philosophy, and the rather, because it is a known fact that the ashes of many plants abound with the substances predominating in the soil that produced them. We will in all probability come nearer to the truth, by considering the putrescible manures and the sap only, as the elements of food; and the other bodies as subservient, though in a less degree, to the health, solidity, strength, or the right performance of the vegetable functions.

Although the roots form the grand channel by which sustenance is conveyed, and, in order to answer this necessary end, are of a vasular texture, yet the leaves are no less necessary for the growth and health of the vegetable; and the atmosphere is wisely and beneficently constituted, that it may be affected and purified by their agency. They serve the same purpose as lungs in the animal economy, and by them is exhaled the superfluous part of the water in the sap; and what remains, acquires new properties, and descends along the bark to administer nourishment. So indispensable are they for the necessary functions of vegetation, that if stripped off, the flowers, that otherwise would follow, will not open and expand their blossoms, nor the seeds come to maturity: in many cases the plant will die altogether. During sunshine leaves elevate themselves upon their footstalks, and seem to move towards that luminary. In darkness they shut and contract their outer edges, and are then said to sleep. If violently turned round, so that the under becomes the upper side, they will twist their fibres, and regain their natural position. When placed in a window, they will turn towards the light, and as often as the pot is shifted round, so often will they bend back and spread their broad surface to the refreshing influences of day. These all are curious properties; but the most essential function they perform is their decomposing carbonic acid. This gas they attract from the atmosphere, of which it always forms a constituent part; and after decomposing it they retain the carbon or charcoal, and discharge the pure oxygene or respirable air. Carbon, therefore, which is unquestionably a prime ingredient of vegetable food is supplied by the leaves from the atmosphere, and by the roots from the earth. It is owing to this capacity of the plant to take in carbonaceous matter either above or below, that so many species can be turned upside down; the roots growing into branches, and the branches into roots. All the willow tribes, and even the gooseberry and currant bushes can submit to this violent, and seemingly unnatural inversion. Dig up at this season, or early in the Spring, any one of these last, and plant the branches immediately in the ground, the elevated roots will send out buds, leaves, flowers and fruit; and in the course of next Summer the bush will undergo such a complete alteration as not to be distinguishable from any other of the same species in the garden. I have tried

several experiments of this kind, and never failed but once, when age and previous decay in the subject had enfeebled the powers of vegetation. It succeeds best in saplings of a single stem.

This succinct view of chemical agriculture which I have exhibited suggests a variety of moral reflections, too important and too useful to be omitted ; and which, I hope, will not be deemed intrusive at the close of this abstract inquiry. I shall pass over the greater part of them, and confine my attention chiefly to two. One is not able to contemplate the putrefactive process, and the uses it serves in the vegetable kingdom, without being struck with this admirable contrivance of Divine Wisdom to remove from our sight the putrid remains of animal and vegetable bodies, and change them into new and nutritious forms. The beauty of the universe would have been much marred, and our senses continually offended, without this expedient of putrefaction which sweeps away all trace of former organized beings, by converting them into pure and uncontaminated gases. These retain no tincture of their former corruption, and are ready to enter into new bodies, invested with all the attributes of healthful, enlivening and agreeable existence. The vegetables cooked for our table, the butcher-meat under which it groans, are no other than new combinations of those putrid and nauseous steams, which, in the act of passing off, assailed our nostrils with ungrateful odours. The dunghill which the farmer carts to the neighbouring field, returns to him at harvest in the shape of useful roots or yellow sheaves, free from all polluted admixture, and refined from the dross in the elaboratory of vegetation. I know no indication of greater skill in the Divine Intelligence, nor a more indubitable mark of His care and goodness, than this contrivance of resolving all dead animal and vegetable matter into elementary principles ; that, in the first place, He might relieve the earth of such loathsome incumbrances, and in the next place, be supplied with fresh materials out of which to form and sustain the new and successive families of plants. In a similar manner the excrementitious matter passing from man and all other animals is disposed of. In the form of manures, it is buried in the ground, which absorbs all its noxious effluvia ; and in place of exciting in us revolting sensations, it becomes the most powerful restorative of our exhausted fields. There it is decomposed by the solvent powers of heat and water, and supplies abundance of nourishment to the grasses and corn vegetating over it.

This is not all : there is an order in the destruction and decomposition of all things equally beautiful and surprising. Man, who from the superiority of his natural powers is obviously placed at the head of the creation, lives chiefly on the flesh of the irrational, and on the seeds of the vegetable tribes. The lower animals, with the exception of the voracious kinds, live almost on stems, footstalks and leaves ; plants live not on themselves or animals, while their structure is perfect and entire, and while they are suitable for the support of the higher orders of organized existence, but as soon as their structure is destroyed, and they begin to pass into corruption, they feed quickly on the decom-

posing matter ; and the earth and air, as the great consumers, absorb and swallow up them all.

Although the atmosphere becomes the receptacle of the volatile parts arising from the decay of putrescant substances, and likewise of the gases which are formed and liberated by the processes of fermentation, of combustion, of breathing and of elective affinity, it wonderfully preserves its own purity, and restores, by a multiplicity of physical means, whatever is superfluous and unnecessary for its own composition ; and this is effected by the new combinations, which the forms of matter are unceasingly assuming in the mineral, vegetable and animal kingdoms. Nor is the soil to be regarded as the grave of the dead organized systems which it is constantly receiving. It hastily dissolves them into carbonaceous matter, into fluid or aeriform products, which, either by the roots or leaves, go to the support of the incumbent crops. Thus the soil supports plants, plants animals, animals and plants support man. They are all compounded of a few simple elementary substances, which are perpetually revolving into each other by laws and processes discovered by chemistry, and set in a clear and striking light.

I have further to remark, that if Nature has fallen on this admirable contrivance to get rid of animal, vegetable, and excrementitious matter, she has shown herself no less provident and skilful in preserving the balance of the atmosphere, that it may at all times be fit for respiration, and the other necessary purposes of life. The air, which is inhaled, produces certain known effects upon the blood; and, by its transmission through the lungs, is itself changed by losing about *8 per cent. of oxygene, and acquiring an *exactly equal bulk* of carbonic acid. This waste of the respirable portion of the air must be great beyond conception, when we consider the unceasing action of breathing, and the infinite number of animals existing on the face of the globe. All tribes of living being, that walk the earth, or wing the air, the largest and most perfect, as well as the most diminutive and insignificant, are during every moment of their existence consuming oxygenous gas, and thus robbing the air of its principle of vitality. They are doing more: they are throwing back by expiration the azote unchanged and of itself deleterious, and also a quantity of carbonic acid almost equally destructive of life; and by this double process they are affecting the purity of our atmosphere, It must be plain, that its salubrity would have been long ago destroyed, had not nature provided some countervailing expedients. Of these, the process of vegetation may be accounted one. The leaves of plants possess the property of decomposing carbonic acid, of combining with the charcoal, and, when acted on by the sun's rays, emitting the pure oxygene. It is the opinion of some physiologists. that this effect induced on carbonic gas arises not so much from the living functions of the plant, as from the chemical influence of the solar light; and they contend, that all vegetables exert on the air a permanent agency of deterioration analogous to that of animals ; and

*See Messrs. Allen & Pepy's experiments on respired air.

that both classes, on the whole of their functions, convert the pure part of the air into carbonic acid. Mr. D. Ellis, who has made the latest researches into this branch of natural science, has been conducted by a careful examination as well of the labours of his predecessors, as of the phenomena which he has himself investigated, to one grand general result: That all living natures, beginning at the least perfect of the vegetable families, and tracing all the genera and species of that kingdom, and then proceeding, in like manner, from the most minute and least complex structures of perception and sensation, whether aquatic or terrestrial, up to man, the sovereign of the creation, are, during the exercise of the respiratory organs—whether leaves or lungs—constantly changing the oxygene of the atmosphere, or of the air of the fluids on which they live, into carbonic acid; and that this change, which effects the evolution of *caloric*, is essential to that assemblage of occurrences, and to that organization which are expressed by the term—life. Others have opposed this conclusion; and among these may be reckoned Priestly, Ingenhousz, Woodhouse, De Saussure and Davy, who insist, that when a growing plant is exposed, in the presence of solar light, to a given quantity of atmospherical air, the carbonic acid is, after a certain time, destroyed, and oxygene found in its place; so that carbon is added to plants from the air by the process of vegetation, and oxygene to the atmosphere. Both parties, however much they differ in other respects, admit this power in plants of reducing carbonic gas to its elementary parts during sunshine; but the first regard it as the means of only throwing the acid out of the leaves, that they may assume or preserve their green colour, which is dependent on the predominance of alkaline matter in the juices; while the second refer it to that final cause, which sustains, for the purposes of life, the uniformity of the composition of our atmosphere. According to them, plants in this way restore to the air the vital principle of which it is deprived by animals; and these two kingdoms perform mutually a service of the utmost importance to each other. The balance of the universe is preserved by their reciprocal counteraction; for without animal life the air would not be surcharged with an excess of carbonic acid, and without vegetables there would be a deficiency of oxygene.

The more we investigate the works of nature, the more we are struck with astonishing indications of wisdom and design. Chemical Agriculture not only enlightens the understanding, but betters the heart, by opening up endless and illustrious displays of that infinite power and goodness which preside over all things.

Halifax, Sept. 30, 1818.

TO CORRESPONDENTS.

I am again favoured this week with several communications, and although I cannot acknowledge them individually, I am duly sensible of their merit and importance. I have received Henry's Chemistry

from Mr. John Lawson, Jr., with the specimen of shells. The marl and limestone he alludes to would be acceptable, with a chemical analysis of both by means of the muriatic acid, which he would find an amusing, and by no means a difficult, experiment. The end is: to ascertain the quantity of calcareous earth in both, on which their efficacy as manures depends. To CINCINNATUS, I return my thanks for his warm interest in my general views; and even the RURALIST, who sung so sweetly in his native tongue, must not be forgotten. It is when men, actuated by one powerful and common feeling, unite in achieving a great object, that they can be crowned with success. A single individual sinks under the burden of a vast undertaking. I call on the active and strenuous exertions of my friends for practical information on the nature and composition of the soils found in different parts of the Province.

No. 12.

ON SOIL.

THE soil, with which the surface of our globe is invested, is composed of a variety of ingredients, by no means of one uniform character; but possessing distinctive and, in some measure, opposite properties. It is owing to this original diversity that some lands are of themselves barren, and others fruitful; and this, too, before the application of manures has modified their texture and combination. Among the principal objects of Agriculture is to correct the natural defects of a bad soil, and by foreign mixtures to subdue its sterility; and even land, that is genial and productive, is not placed beyond the reach and assistance of art, because it may have been impoverished by repeated cropping, or spoiled by injudicious management. The remedies, which may be safely prescribed, and successfully applied to one field, may be destructive to another; and hence without skill there is always hazard in tampering with improvements. The fact is, that the rudiments of scientific farming must be begun with the knowledge and treatment of soil; and we will be greatly helped in this attainment by inquiring beforehand, what purposes it serves in the growth of plants. When these are clearly ascertained, we shall proceed with some sort of confidence in our plans of melioration; for in most cases, all failures may be traced to a misconception or mistake in the principles. If we shall be fortunate to detect the uses, to which the soil is subservient in the secret and mysterious processes of nature, we shall thereby be enabled to judge, in what manner we should set about either the improving or the altering of its qualities.

As I am now approaching the practical part of the system which I have proposed to illustrate, and as there runs from beginning to end an intimate connection between its views, the attention of my readers must not relax; for if they wish to understand it, it must be studied and embraced as a whole. That imperfect and vague knowledge, which takes up with detail, and rests on detached and insulated points, breathes nothing of the genius of science, that from particulars rises to general and comprehensive conclusions; that combines scattered facts, and disposes them in order; and that develops the laws by which all the effects are governed and produced. A neglect of carefully perusing these letters, as they issue from the press, will disqualify my readers from enjoying the further benefit of instruction; and as I aim only at their improvement, let me be rewarded at least with a systematic, patient, and uninterrupted hearing. There are some obvious advantages, besides, attending the union of theory with practice; and in the present advanced state of agricultural information, it is disgraceful in us to remain any longer ignorant of its first and elementary principles. I am far from expecting that these essays will enlighten the great body of farmers, some of whom will never honour them even with a transient

notice; while others will despise them as unavailing or delusive speculations; but I do hope that a select few will devour them greedily; and digest them into intellectual food. These last must not be fettered by the injudicious and unskilful modes which obtain; but boldly taking the lead, and stimulated by new and commanding motives, must start forward from the boundaries of the present system, and enter upon an untried course. Their success will draw after them a humble train of followers; and the improvements introduced at first by the few, will in the long run become the practice of the many. The indigent and remote settler, who would be fearful to deviate from the beaten track, and on whose mind the light of science has scarcely dawned, can be much more easily excited to action by a successful example than by the soundest precepts. Self-interest will spur him to imitation, where success has led the way; while his incapacity and dullness will exclude him from all the benefits of being taught by reading,

The purposes, which the soil serves in the vegetable economy, may be brought under three great divisions, which I shall elucidate in order, that they may be understood with precision, and retained with the slightest effort of memory.

First—The soil is the bed in which the roots sink and extend themselves. The stems and trunks of all plants and trees rise in a line perpendicular to the horizon; and they would maintain this position, were they not disturbed by external agents and the agitation of the winds. So universal is this law, that several naturalists have attempted to account for it; and Sir H. Davy, in his second lecture before the Board of Agriculture, quotes an experiment of Mr. Knight, undertaken with a view of showing that gravitation has a powerful influence in determining the direction of the roots and branches. Whatever may be the philosophical explanation of this phenomenon, the fact is undisputed: and every person may satisfy his own mind by examining a field of standing corn upon a declivity. He will observe that all the stalks grow upright, and are little influenced in their perpendicular elevation by the inequalities of the ground. The common oats are erect, that stand on the sloping side, as well as those on the level top of the ridge; and all the healthy and vigorous stems are nearly as perpendicular as if set by a plummet. From this peculiarity of plants, a very useful practical inference has been drawn, and which has been confirmed by an unvarying experience: that no more corn or trees can grow upon the sides of a mountain round and round, than upon the horizontal base which it covers; and that whatever the number of acres may be on the extended surface, they will yield no greater a crop than what would grow on the level, were the mountain removed. From this we may determine the value of lands in particular hanging situations, and the quantity of seed with which they should be sown.

This perpendicular erectness in the vegetable structure could not be preserved without the support of the roots, which are extended in the soil. The winds blow successively from all quarters of the heavens; and the roots require to spread in every direction in order to resist

their unceasing impulse. Hence the stem may be considered as a centre, from which radiate the fibres to every point of the compass. These part, as they advance, into minute subdivisions, lay firmer hold on the soil, and thus enable the plant to withstand all the currents of our atmosphere. The hold which the roots take of the ground, where they meet with no natural obstruction, is proportioned to the girth and tallness of the trunk. A tender and delicate shrub throws its fibres a short way, compared with the distance gained by those of the mountain oak, or the stately cedar. These latter stretch themselves below as far as they do above, and cling so firmly to the soil, as to bid defiance to all the efforts of human strength, and, generally, to the wildest fury of the elements.

There seems even to be an accommodating capacity in the larger vegetable productions, to adjust the strength and firmness of their roots to the situation in which they happen to be planted. Mr. T. A. Knight, who has communicated to the scientific world in the *Philosophical Translations a set of curious and interesting experiments on the motion of the sap, and the laws to which it is subject, found, that its ascent in the stem was a good deal modified by the agitation of the winds. If a tree be planted in a high and exposed situation, where it is kept in ceaseless motion, the new matter that is generated will be deposited chiefly in the roots and in the lower parts of the trunk. This arises from the interruption given to the progress of the ascending sap, and accounts for the low and sturdy appearance of the pine, which stands alone on the craggy eminence. The same pine, surrounded on all sides by a forest, will assume a very different form; for being deprived of part of its motion, it brings another cause into action. The leaves, on the lateral branches, will be partly excluded from the influences of light; and of course, the sap will not so rapidly undergo those changes, which in its descent fit it for increasing the alburnum, and enlarging the dimensions of the woody fibre. These branches, thus impaired in vigour, will require less sap to support their diminished growth; more, in consequence, remains for the leading shoots, which elongate themselves with a powerful energy; and the pine will contend with all its neighbors for superiority, as if endued with the passions and propensities of animal life. The tall slender trunks, which we meet with in the thickest of the wilderness, have been stretched to their present height by the operation of this law; and if left, without support, to brave the violence of the tempest, would be speedily overturned: because the roots and stems have neither been thickened nor invigorated by the effects of constant motion in the breeze. They rise erect on their bases; but the roots are comparatively feeble, and but little extended.

This support, which is given to vegetable perpendicularity by the earth, is not the only use of the extension of the roots in it. It is secondary, only to a more important end—the extraction of nourish-

*Phil. Trans. 1803. Part 2d. 1804 Part 1st.

ment for the plant. This has been the primary purpose which nature has intended in the formation and organic texture of the fibres; which are the means given to the vegetable tribes to collect the sap circulating below the surface, and enriched with the products of putrefaction. They are organs of a curious mechanical construction, admirably adapted to convey to the stem, branches and leaves, the nutriment essential to their growth and perfection. The soil may be considered as the pasture in which the fibrous roots go out to feed; and the more easily they can penetrate in all directions, so much more aliment will they gather, and so much more vigorous will the plant become. That this is the principal use of the roots, is apparent from their very structure. Where they immediately issue from the stem, they are thicker and stronger than at their more distant extremities; and in fact their size diminishes gradually into an almost imperceptable filament. Their slender threads suck in the subtle juices; discharge them backward towards the branch of which they more directly form a part; this branch carries them to the larger trunk from which itself issued; the trunk conducts them to the base of the stem, where they blend and mount up with the general sap collected by all the roots. That this is not a theoretical, but a correct description of the process, may be proved by experiment. Lay bare the roots of any plant, and cut with a sharp instrument one of the chief leaders close to the stem; raise the leader a little upwards above the surface without disturbing it materially in the earth; and in the course of a few hours the sap, coming from the distant parts, will be quite visible at the incision; and in many species it will there elaborate a new stem, which will shoot up and grow to a perfect plant.

The inference to be drawn from this first view of the soil is: that the judicious farmer will remove from it all sorts of obstructions, as stones and roots; for it will be most productive, when it is rendered by tillage loose and crumbling, so that the flexible and fine fibres may stretch themselves in all directions.

II. The soil is the laboratory in which putrefaction is carried on. Some of the primitive earths are much more capable of resolving animal and vegetable bodies into their elementary principles than others. In stiff clay putrefaction goes on at a very slow pace; in sand and gravel the process is more rapid; and in caustic lime and magnesia it is quickest of all: yet every one of them possesses this power to a certain extent, and as they are usually found on the surface of our globe in a state of combination, all soils, in a greater or less degree, can decompose organized substances. The stubble which is buried by the ploughshare entirely disappears in the course of the season: and a dead animal deposited in the ground, although it takes a longer space to pass into corruption, leaves in the end no trace of its existence, except in deepening the colour of its grave with a blackish hue. Bones themselves yield to the dissolving powers of the soil, as well as horns, claws, and all other hard animal substances. Even the metals are not able to resist its corrosive action. Iron and steel wear away by throwing off

incessant coats and incrustations of rust; and gold and silver—the most precious of them all—lose their brilliancy, and submit to the general law of dissolution.

The earth has not only the property of decomposing animal and vegetable substances, but what is more essential, it has the power of retaining the putrid steams which arise from them. Were the gases, into which bodies dissolve themselves, to escape immediately from the ground, as through a sieve, at the moment of their disunion, it would be unfit for the purposes of vegetation; but when it absorbs and gradually gives them out according to the action of chemical affinities, we behold it endowed with an admirable quality for the support of vegetable Nature. Nothing is established on clearer evidence, nor more consonant with our experience, than this absorption by the soil of putrid effluvia. If a dead body is suffered to rot either in air or water, it emits a pestilential stench, because neither of these elements is capable of absorbing or retaining it: but when buried in the ground it no longer offends our senses, or vitiates the atmosphere. It returns into the bosom of the great mother of all things, and is there refined from its impurities. The church-yard, where moulder into rottenness the ashes of our forefathers, is not more insalubrious than the festive hall which resounded with their merriment, or the temple where they melted into one reverential and devout feeling.

The earth not only absorbs all the effluvia of corrupted animal and vegetable matter lying in itself but it attracts these effluvia when set at liberty, and floating in the atmosphere. Dr. Priestly found, that when he brought air impregnated with putrid vapours into contact with fresh mould, it inhaled them greedily, and did this more rapidly upon being stirred. On this circumstance depend perhaps the great salubrity of the atmosphere in the country, and the healthiness of those who are employed, either in following the plough or digging the ground. The fresh turned up glebe purifies the surrounding air by attracting from its volume whatsoever is injurious to respiration.

From this second view of soil we may consider it as the great receptacle and provider of vegetable food, where it is prepared, as in the stomach of animals, for entering the ducts and tubes, which convey it along the stem to the most distant parts of the living vegetable system.

But although this be the grand use of the soil with regard to food, it is not the only one, because it affords for the same purpose part of its own constituent elements. Silex or sand exists in that thin exterior bark, which serves the same important ends in the vegetable, as does the *epidermis* in the animal economy; and with physiologists it passes usually by the same name. In all the classes which have a hollow stalk, such as the cereal gramina, reeds and canes, this epidermis or outer covering is wonderfully strong, and is woven like a glassy network. By means of this silicious and hard structure the perpendicular position of wheat, oats, rye and barley is preserved; and the plant itself is defended from the puncture of insects, which might otherwise pierce into the sap, and withdraw the vegetable nutriment. The other

three earths, which will be described in the following letter—clay, lime and magnesia—are also found in plants, and constitute the principal matter of their ashes, which is insoluble in water. These earths, as has been lately discovered, are metallic oxides; and their bases consist of highly inflammable metals which, from their strong affinity to oxygene, can hardly be exhibited in their simple state. It is extremely improbable that the living power of vegetation can decompose the earth of flint, and in this form introduce it into the system; yet as it is insoluble in water, it is difficult to conceive in what other manner it can combine with the sap and be assimilated to the organs. The lights of chemistry are insufficient to illuminate our path in these dark and mysterious researches.

III. The soil is the reservoir whence plants are supplied chiefly with moisture. It is true, that by their leaves they can attract it also from the atmosphere, for during night they certainly sip the dews; and, besides, they are found to increase in weight during moist weather, even when the earth that supports them is purposely protected from wet. But their greatest and principal supply of this necessary fluid must be drawn from the ground by the absorbent vessels of their roots. The rains and showers moisten the soil, flow through all its crevices, and lodge there till they are wasted by evaporation and by plants. If there be a long continuance of drought, the whole vegetable kingdom languishes under the privation; and at all times the future harvest is very much regulated by the abundance or deficiency of moisture. All soils are not equally susceptible of retaining it when it falls from the heavens: some of a sandy and gravelly contexture, allow it to pass so quickly through their interstices, that it administers little or no benefit; others of a clayey cast, hold it so tenaciously, that they cake and consolidate into a compact body, and are, on that account, as unfriendly to vegetation as the former. Both of these kinds are naturally barren; and they can admit of improvement only by blending their opposite qualities. In the one, plants are parched for the want of humidity; in the other they are drowned by an excess of it. The sandy deserts of Nubia have been cursed with perpetual sterility as far back as the monuments of history reach, though placed in the immediate neighbourhood of the rich plains and dense population of Egypt; and modern improvement, in her wild range of discovery, has pronounced them incurable. The stiff clayey soils, however, are capable of melioration by paring and burning the surface, by the application of lime and sea-coal ashes, and by a naked fallow which exposes the surface to the intense influence of the summer's sun. A mouldering loam of all others is best adapted for furnishing to the incumbent crop the necessary quantity of water. It is not so retentive as clay, nor loose as sand, but enjoys a happy combination of consistence on the one hand, and friability on the other. The juices contained in it are drawn up by the roots, and as it binds not by heat into a solid mass, it continually affords a supply to support the circulation of the sap. Pure sand without a mixture of clay is absolutely sterile; and pure clay, before its cohesion

be destroyed by lime, by marl, or by compost manures, is equally unblest by the genial power of vegetation. I know no soils more unfertile than the stiff tilly clays, commonly called *moors* in the old country, which barely afford a green sward to cover their nakedness.

A rich mould not only retains moisture in itself, but has the power of attracting it from the atmosphere; and, what is still more wonderful, attracts it in exact proportion to its fertility. Professor Davy found upon exposing to the air different soils, dried to 212 degrees of heat, that those which gained most weight in a given time from the absorption of moisture, were also the most fertile. The animal and vegetable decomposing matter, with which they abound, exerts a powerful attraction on the watery vapours suspended in the atmosphere, and drinks them to repair the waste by growing vegetables, and to replenish its own exhaustion. This is an experiment within everybody's reach, and as I am anxious to diffuse a spirit of investigation—the infallible precursor of improvement—I require some one of my correspondents to make trial, and communicate the result. Let him take from a cucumber bed a portion of earth, and dry it in a common pot or frying pan over the fire, till the mercury in the thermometer, when the bulb is plunged in the earth, rises to 212 degrees. Let him perform the same process on sand taken from the sea-shore, and on earth from a common or some uncultivated field. Weigh a pound of each accurately in a scale, and put the three parcels into flat earthen vessels of the same size, that equal surfaces may be exposed to the atmosphere. Set them out all night, but under a shade, and again weigh them separately in the morning. The sea-sand should be lightest, and the richest soil the heavier of the other two.

I shall not prosecute this subject farther at present, but conclude with one general observation derived from the previous facts and reasoning:—that a productive mould should be sufficiently pulverized and broken, in order to admit the roots to expand themselves freely; that it should contain putrescible matter to afford nourishment to the crop; and that it should be of such a texture as neither to keep the roots soaking in water, not yet too dry, but so happily tempered and compounded of ingredients, as to supply that portion of moisture necessary for the circulation of the sap. I believe the soil serves no other purposes than those now explained and enumerated; and by duly appreciating their importance, and keeping them steadily in view, the practical farmer will be furnished with principles from which to judge of the defects in any particular tract of land under his management, and also to estimate the fitness of the remedies for its improvement.

Halifax, October 5, 1818.

TO CORRESPONDENTS.

There has been a great falling off in the number of my communications, since I entered on Agricultural Chemistry. The subject, I fear, is deemed of such trivial importance, as to excite neither comment

nor discussion. If such be the state of the public feeling, it angurs ill of our improvement: for I hold it as incontrovertible, that till science shall enlighten our manual operations, they must be clumsily performed. I request my readers, then, and correspondents, to take a second, and a third review of these two letters, thoroughly to digest them, and even to prosecute their researches in that line of study. All great improvements have originated from men, who combined science with practice; and there is not at present a more popular pursuit in England, nor a more interesting topic of conversation in well informed circles, than the philosophical and leading doctrines of Agriculture. This art is now clearly understood to be the chief support of national greatness and independence; and the various questions in political economy, to which it gives rise and affords a solution, all hold a share in the general interest.

Amid this dearth of intelligence, I am cheered with one letter from a quarter, where reside the necessary knowledge to be useful, and the positive promise of future aid. I anxiously expect his communications prepared for the public eye; and in the mean time I proffer him by thanks.

No. 13.

ON SOIL.

WHEN we cast our eye on the surface of this globe, and observe such a multitude of materials, differing in their colour, bulk, form, weight, and other sensible qualities, all of them scattered in disorder and blended in endless combinations, we are ready to conclude that their number must be infinite, and their disposition under the guidance of no general laws. No judgment could be more precipitate or worse founded. In this apparent scene of confusion the utmost regularity prevails: and the whole mass is made up of a few simple ingredients. The order of the parts is so determinate, that it obtains not only at the surface, but in the very bowels of the earth. The internal structure is composed of strata, either loose or solid, as far down as human art has been able to penetrate, and the presumption is, that they extend to a vast depth. With regard to Agriculture, our geological inquiries are bounded to the soil on which we tread, and to the substratum which supports it. These, in a judicious system of farming, are objects of great interest and importance; and both of them should be examined with a scrupulous nicety. The obstacles, which baffle the hopes of improvement, are just as likely to lie in the subsoil which is placed beyond the reach of the ploughshare, as in the upper surface, which is more immediately subjected to culture; and for this reason, neither of them ought to be overlooked nor disregarded. A coat of stiff clay has been rendered productive by the mere circumstance of resting on a bed of sand, or a rock of limestone; and, therefore, every cultivator, who wishes to pursue a course of good management, should go over all his fields, by digging pits in various places of at least eighteen inches down, that he may know and discover the materials on which he is to operate. He can then lay his plan with greater certainty of success, and, what often happens, the subsoil may furnish him with the means by which to ameliorate the surface.

In the progress of this letter, I shall direct the attention of my readers to the component principles, which constitute that exterior covering of earth, with which our globe is encompassed; I shall enumerate and explain their qualities as far as respects vegetation; and I shall point out some of the advantages which must result to Agriclture in this province, from beginning to analyze our soils.

Notwithstanding the different appearances which the surface exhibits, it is, in realty, compounded, in all its varieties of wet and dry, of warm and cold, of light and heavy, of barren and fruitful, only of four simple and primitive earths—clay, sand, lime, and magnesia.

I. Clay, called indifferently in agricultural publications, alumine or argillaceous earth, is a substance so easily distinguished from all others, and so familiarly known, that it needs no particular description. When pure, it is white, and when chrystallized, becomes the white sapphire; but in general it is found discoloured by the mineral waters,

which are perpetually escaping from their beds, and running on the surface. It is tinged with blue, brown, grey, and red shades, for it has a strong affinity to all colouring matter, but these affect it not materially in an agricultural point of view, and are, therefore, of little consequence. As an ingredient of soil, it has the four following properties, by which it exerts a powerful effect on vegetation:

1st—It absorbs water like a sponge, and is so close in the texture as to prevent it from filtering through its pores.

2nd—When thoroughly soaked, and afterwards dried, it hardens and cakes into a solid mass.

3rd—It shrinks considerably in bulk, when exposed to heat, and the contraction of its parts is in proportion to the intensity of that heat. It thus forms an exception to that almost general law, by which bodies expand under the action of caloric: and when once strongly heated, it is ever after less coherent.

4th—It powerfully retards putrefaction by enclosing as in a case, animal and vegetable remains, and thus shutting out the dissolvent action of the external air.

If we shall now call to our recollection the purposes served by the soil, and detailed in my last letter, we shall be enabled to judge how far clay, in its original and unsubdued state, is favourable to vegetation. The roots, which are the collectors of the nutriment, and are withal of a tender and delicate texture, cannot easily stretch themselves in a substance of such stiffness and tenacity; and which besides so readily consolidates after rain into a compact body. Its closeness opposes material resistence to their extension, and accordingly, in its unmellowed state, the fibres are hampered, and cannot ramble forth to pasture. Besides, admitting that they overcome in part this obstacle in the soil, they must, whenever it hardens in the sun and gapes into chinks, be violently torn asunder, and separated from the stem. The stronger fibres may escape unhurt; but, generally speaking, the finer and more slender filaments must suffer considerably.

If clay be so hurtful on the surface, it is almost equally pernicious in the subsoil, from the capacity it has of interrupting the passage of water downwards, and of keeping the roots perpetually drenched—evils no less destructive to the health and vigour of the crop than the opposite extremes. Again, from its antiseptic power putrefaction goes on slowly, and the vegetables growing on it are ill supplied with that generous and nutritious food so essential to their perfection and maturity. All its qualities, therefore, are unfriendly to vegetation, except its capacity of absorbing and retaining moisture; and this is of such immense importance as, in some measure, to make atonement for its other defects. When existing by itself, this virtue, which it possesses in so eminent a degree, is useless and unavailing; but when mixed with other materials of a loose and friable nature, it gives tenacity and firmness to the whole, absorbs the aqueous vapours which are suspended in our atmosphere, and is highly retentive of the dews and rains which fall to fertilize the soil.

II. Sand or gravel, called sometimes silex, silica, silicious matter, or earth of flints, is distinguished by properties of a totally opposite character, which require to be enumerated that their influence may be distinctly and visibly displayed.

1st—Sand is incapable of retaining water when poured on it, and far more of attracting moisture from the atmosphere.

2nd—It powerfully promotes putrefaction; but it allows the gases set at liberty to escape, and the soluble fluid matter to descend.

3rd—It has little or no cohesion among its parts, and never binds by the alternations of wet and dry weather into a compact body.

It will appear from this account of the properties of sand, that it is provided as a corrector of alumine; and that in their effects, the two are destined to counterwork each other. This sort of contrivance in nature is no uncommon occurrence; and while we trace such curious adaptations, we are struck with the wisdom that fabricated and reared this noble edifice. Inconveniences are obviated by correspondent checks, and this system of balancing all things displays more conspicuously the indications of designs, than if there had been no difficulties to overcome, and no evils to remedy. Let us contrast sand and clay in their qualities, that this singular and important truth may be more strongly impressed. Sand suffers water to filter easily through its pores; clay is highly retentive: sand promotes putrefaction; clay delays it, but absorbs the gases which are formed in the decomposition; sand opens an unobstructed path for the extension of the roots; clay gives them firmness in their course, and supplies the moisture which sustains them: in fine, the two may be classed among the contending elements, of which a union heightens their common virtues, and rectifies and subdues their defects.

III. Lime, commonly called calcareous earth, enters into the composition of soils. This is never found naturally in a pure state, but in combination with the acids—chiefly with the carbonic, for which it has so strong an affinity that it attracts it from the atmosphere. The burning of limestone is undertaken for no other purpose than to expel by heat this gas, and reduce the base to a caustic powder, for the purpose either of building or of agriculture; and in the process it loses about the half of its weight. But no sooner is quicklime applied to use, and exposed to the atmosphere, than it greedily absorbs at first moisture, and then carbonic acid; and thus either in the ground or in the new-formed wall, it quickly hardens and returns to its original state.

1st—Lime is closer than sand, but much less adhesive than clay. It occupies therefore, a middle region between the two, free from their imperfections, and blending their common qualities.

2nd—In its caustic state, it is a powerful promoter of putrefaction, and helps to decompose the animal and vegetable matter lying in the soil. To this circumstance is owing, to a certain extent, its efficacy as a manure.

3rd—It has the power of combining with carbonic acid in different proportions. In the common state in which it is found as limestone, it

is perfectly insoluble in water, and of course is denied all entrance, by means of the sap, into the composition of plants; but it can unite with an additional dose of the acid and then constitute what is called a *hypercarbonate. This compound possesses new properties which render it subservient to vegetation; for it is highly soluble in water, and the excess of carbonic acid adheres very loosely to the base, and can be expelled by a slight degree of heat. 'Hence the lime helps to fix the carbonic acid, which is generated by the fermentation of putrescent manures in the soil, or which floats in the air on the surface of the earth, and it freely imparts this gas, in union with water, for the nourishment of plants.'

It is not necessary to dilate farther upon the properties of calcareous earth, as at the first glance, it must be recognized as an extremely valuable ingredient; and accordingly, wherever Agriculture is carried on with spirit, it is eagerly sought after, though at a high price. This earth exists in immense abundance among the solid strata of our globe, mostly without any foreign mixture, except the acids with which it combines; but occasionally it is blended also with the other primitive masses. With carbonic acid, which in a previous letter I particularly described, it forms the most frequent compounds—denominated carbonates of lime—and assumes a variety of names and appearances, and even possesses distinct properties. Spar, marble, stalactites, limestone and chalk are all varities of this combination. With the sulphuric acid (which is composed of sulphur and oxygene) it forms plaster of Paris—a rock well known, as it is profusely scattered by the hand of nature throughout this Province. Lime is, also, found mixed with clay, and some times with sand, and then receives the appellation of marl, and which is valuable precisely in proportion to the quantity of this earth. Sea shells, too, derive their fertilizing qualities from the lime of which they are composed; and, without descending to farther particulars, it may be safely affirmed that so necessary is calcareous earth in the composition of soils that wherever nature has not blended it in their original formation, the agriculturist should, though at great expense and much trouble, supply the deficiency.

IV. The last earth which has been found in soils, and that, too, in a much smaller proportion than the other three, is magnesia—a substance with which every farmer must be acquainted, since it is commonly used as a medicine of the shops. Its properties are nearly analogous to those of lime, and were long supposed to operate in the same way. It has also a strong, though less affinity, for carbonic acid, and often forms a constituent principle in limestone rock; but at present agriculturists are divided about its usefulness as a manure, some of them holding it up as a poison to plants, and others defending it by an appeal to experiments. Mr. Tennant was among the first in England who raised an outcry against the magnesian limestone, and who was at the pains to analyze it, that he might detect the pernicious

*Farmer's Magazine, vol. 16, page 486.

principle it contained. In 100 parts of the rock he found that there were from 20 to 22 of pure magnesia, and that the rest consisted of lime, carbonic acid and oxide of iron. He ascribed at once the deleterious effects to the presence of the magnesia; and Sir H. Davy has since attempted to account for the phenomenon by referring it to the property possessed by this earth, of remaining for months in a caustic state, although exposed to the air. It becomes quite harmless so soon as combined with carbonic acid; and in many cases seems, in its mild state a useful constituent of soils. It is found in the Counties of Summerset, Leicester, Derby, Durham and York; and I believe also in Shropshire. The abundance of magnesia in the soils of so many English counties, and these of eminent fertility, has given reason to doubt altogether of the justness of Mr. Tennant's objections, and to seek for some other cause in explanation of the effect. It has been therefore supposed that the soil, which was the subject of experiment, had been previously overcharged with magnesia, and that the noxious influence was owing to supersaturation. It is not worth while to introduce my readers further into this dispute, as I am uncertain whether our limestone contains any portion of magnesia; although its presence in the old country, upon accurate investigation, is found to be a very common occurrence. At all events, it is probably only pernicious when applied in an excessive dose; and this holds equally true with respect to lime; for these two earths should, in all cases, be used sparingly by the skilful cultivator.

On analyzing the various soils and subsoils, they have been found to resolve themselves into one or all of these primitive earths; and their barrenness and fertility have, in no small degree, depended on the mixing and assorting of these ingredients. Loam is by no means a distinct body, possessing in itself appropriate and marked characters, as many of our farmers with whom I have conversed ignorantly suppose; but is a combination of clay, sand or calcareous matter; and as we advance in science, and men among us arise versed in conducting such investigations, the component parts of our rich intervals and uplands will be ascertained and given to the public. The very diversity, which exists among what are accounted loams, is a decisive proof of what I advance. Some of them we denominate clayey, from the excess of argillaceous matter; others open and light, from the preponderance of sand. In fact, these two original ingredients seem capable of being compounded in such an infinite variety of ways, as to give occasion to that diversified texture of soils met with in all countries and situations; and are contrived to counteract each other's qualities, that by their union, they might furnish the bed of that beautiful and splendid creation of flowers and plants, of shrubs and trees, which decorate the face of nature, and charm us by a sweet assemblage of all that is gay and soft in colouring, with all that is elegant and attractive in design.

Besides these four primitive earths, which constitute equally the soil and subsoil, the upper of these, or the mould as it is sometimes called, contains the putrid relicts of organized substances, that have grown and decayed upon it, or have been conveyed thither in the

progress of cultivation. The decomposition of these is the proximate cause of fertility; and the richness of soils bears reference to the relative quantities. The residual earth remaining, after the process of dissolution, is extremely light in weight, and always of a blackish colour. It is owing to this, that a garden, which has been under long continued culture, approaches to a black shade, progressively deepening according to the abundance of this matter.

In addition, all soils lying in the territories of an old country, are found to contain various chemical compounds, mineral salts, and metallic oxides; some of which are beneficial, others harmless, and a few injurious to vegetation; and which either pre-existed in the strata from which the surface has been formed, or have been carried to it by subterraneous springs, or by foreign causes operating in the course of past ages. These chemical bodies are so few in number, so small in quantity, and generally of such unimportant efficacy in vegetation, that it would be preposterous, considering the present state of knowledge, to dilate upon them in these elementary letters. The most frequent are, Epsom and common salt, combinations of potash, soda, lime, and magnesia, with the acids and the oxide of iron—which last is just the rust produced by exposing this metal to the action of the air. It is this oxide, which gives the brown and reddish colour, as well as the intermediate tints to sand and clay.

It seems plain, that considerable advantages must be derived by the practical farmer from analyzing the different kinds of soils; from comparing the proportion of the earths in the productive, with those found in the barren; from studying the separate effects of these ingredients; and from all these results, deducting the most skilful plan of procedure in effectuating permanent improvements. Chemists of great fame have embarked in this line of research, and vast progress has been made by their elucidations. They have laid down rules to assist and guide the agriculturist in this department of his art, they have exemplified the different processes to be performed, and even described the instruments necessary for an elaborate, and accurate analysis. All this matter lies vastly beyond the limits of our enquiry, and we must wait, till the cultivation of the human intellect, as well as the cultivation of the provincial soil have advanced forward to an unknown and remote distance, ere it can be relished or understood. It would be easy, but extremely injudicious, to transcribe the directions given: and all that I can attempt to achieve, is merely "to hold the mirror up to nature," to portray the images which crowd upon the eye, and by their novelty, their beauty, their importance, their variety, imperiously to excite attention, to awaken enterprise, and, if possible, to create a taste for such investigation.

There is, however, a less laborious and less intricate analysis of soils, defective as our knowledge of chemistry may be, which is placed within our reach; and which may in time lay the foundation of more perfect and accurate methods. Some of my correspondents may repeat the experiment, and communicate to me the products, that I

may publish them and give the farming classes some idea of such researches.

In the field to be examined, take earth a little below the surface, from four separate places, about 1-4 lb. avoirdupois from each. Expose it to the sun, or before the fire, till it is completely dry; and turn it over frequently that it may be well mixed together. From the heap take exactly four ounces, and pass this through a fine sieve, which will allow all the particles of sand and gravel to escape, but which will hold back stones, small fibrous roots, and decayed wood. Weigh the two parts separately, and take a note of each. The stones and other bulky materials are then to be examined apart from the roots and wood. If they are hard and rough to the touch, and scratch glass easily, they are silicious or flinty; if they are, without much difficulty, broken to pieces by the fingers, and can be scraped by a knife to powder, they are aluminous or clayey; or if, when put in a wine glass and common vinegar poured upon them, small air bubbles ascend to the top of the liquid, they are calcareous. The finely divided matter, which ran through the sieve, must next undergo the test of experiment. After being weighed, agitate the whole in water, till the earth be taken up from the bottom and mechanically suspended, adding water till this effect be produced. Allow the mass then to settle for two or three minutes; and in that time the sandy particles shall all have sunk to the bottom. Pour off the water, which will then contain the clay in suspension, and the insoluble earth arising from animal and vegetable decomposition. The sand should first be attended to, and if from inspection it be thought either silicious or calcareous in its nature, the requisite tests may be instantly applied. By this time the mixture will have deposited at the bottom of the vessel the clay, and other earths, with the insoluble animal and vegetable matter. After pouring off the water, dry the sediment, and apply a strong heat by placing it on the bottom of a pot ignited to redness, and the animal and vegetable matter will burn and fly off in aeriform products. The remainder lying in the bottom will be found to consist of clay, magnesia, or lime. To obtain accuracy, another 1-4 lb. of earth should be taken from the same heap, and the whole process gone over a second, a third or even a fourth time, that the operator may rectify any blunders he had previously committed, and be satisfied as to the results of his experiment. He should provide himself with a pair of fine scales and a set of weights divided at least into ounces and drachms. Although vinegar will detect lime by effervescence, it does not dissolve it so effectually as the nitric or muriatic acid; small quantities of which may be procured from the druggists at no great expense. I am particularly anxious to ascertain the existence of lime in our uplands or intervals; because from the vast abundance of gypsum, and limestone-rock in all parts of this Province, I strongly suspect that this earth will be found a very general ingredient in most of our soils.

Halifax, Oct. 12, 1818.

TO CORRESPONDENTS.

This week has been more productive of communications than the last, and those that have come are cheering pledges of a growing interest in my favour. I beg to notice once for all, that it is not in my power to imbody the information given me from different quarters in the immediately succeeding letters, which issue from the Press; because as I am pursuing a general system, I can only introduce it in its appropriate place. I am already in possession of much correspondence that will be useful to me, when I come to treat of manures, and which I shall then duly acknowledge. I hope, therefore, there will be no relaxation in the efforts of my friends; because, perhaps, I have not yet published what they have so kindly communicated.

I have been repeatedly called upon by correspondents to answer "Acadiensis," who attacked my theory of climate in another weekly newspaper; but this I must humbly decline, for as he concedes all I want—the capability of our climate to perfect all sorts of grain and green crops—the controversy would be a useless waste of words. His general approbation of what I have advanced, and his exhortation to encourage me in my course, honied, as he thought, the bitter pill, and more than counterbalanced his difference of opinion on a theoretical doctrine. My design is, not to wrangle and dispute, but to reason and instruct; and if my ultimate conclusions be sound and incontrovertible, indulgence should be extended to the many errors I may commit in the illustration.

No. 14.

ON SOIL.

IN the exposition, which I gave last week, of the ingredients of soil, there was a question which constantly obtruded itself in the course of my reasoning, and which, I doubt not, has also occurred to many of my readers: In what way, and by what means, has nature arranged, mixed and laid these primitive earths on the exterior of our globe? Though this may seem, on first sight, a matter of pure speculation, it will turn out in detail highly instructive and interesting; and naturally conduct us to a more perfect and just idea of the different soils met with in this Province. These may be all classed under the three subsequent heads: UPLAND, INTERVAL and SEA MARSH; each of which claim in order a few words of illustration.

UPLAND is a provincial term applied to all grounds placed at such an elevation as to be above the overflowing of our fresh water rivers, and the tides; and this first class constitutes by far the greatest part of this, as well as of other countries; and owes its origin to the disintegration of the rocks, which constitute the frame of our globe, and on which the soil rests incumbent.

These rocks by geologists have been arranged into *primary* and *secondary*, and marked by distinctive characters. The first are purely crystalline, contain no fragments of previous formations, and are disposed in strata either vertical, or more or less inclined to the horizon. The second are made up of the debris of the first, abound in the remains of vegetables and marine productions, and often present the bones of land animals. The disposition of the two classes, likewise, follows a certain determinate law both with respect to each other; and in regard to the arrangement of the genera of which they are composed. With respect to each other, the secondary always rest on the primary: and as yet no inversion of this order has been found. In the arrangement of the genera belongings to each class, a certain succession has been observed, which infers the existence of a general law, and is analagous to the uniformity, in other respects discoverable in the mineral kingdom. This order of succession is much less distinct in the older and primitive strata, and perhaps too less determinate, than in the more recent formations; yet in these last, it is so fixed, regular, and unvarying, in Great Britain and the other countries of Europe which have been examined, as to entitle geology, in some degree, to the rank and name of a science. The whole series of secondary rocks is nowhere presented complete and unbroken; but the relative place of none of its several members is occupied by another; and they all recline, stratum upon stratum, with a most methodical exactness. Thus, if the numbers 1, 2, 3, 4, 5, 6, be supposed to represent the natural families of secondary rocks, it may happen, that 4 or 5, or both, may be wanting in the stratification; and consequently, 6 be found immediately above 3; but the order is never reversed by the discovery of 1 above 2, nor

of 3 above 4 or 5, or any other number which succeeds it. Particular members may be thrown out altogether in the arrangement, and such irregularities not unfrequently occur; but the series, in no case, is violated by any palpable departure from this rule.

In consequence of the violent changes and concussions to which this earth has been subjected, both the primary and secondary rocks have been disturbed, and heaved into every possible angle of inclination to the horizon. Hence they all come in succession to the surface, present either their sides or fractured edges, and from their own decomposition furnish the materials of the soil which now rests on them. Granite, which would seem to claim the highest antiquity, and be of primeval origin, holds the first place among the primary rocks, and constitutes the greatest mass of terrestial matter. When its composition is examined, we meet with nearly all the elements which go towards the formation of the other rocks; and can easily describe, how its disintegration furnishes an immense variety of new stratified bodies. It is formed of three ingredients—quartz, feldspar and mica; and these contain sand, clay, lime, magnesia, potass and oxide of iron, variously combined. As these substances unite in the secondary formations, and as these formations come to the surface, we are presented with the basis of soils; and their multiplicity need no longer be matter of curiosity and surprise. A naked rock of this kind exposed to the influence of air and water rapidly decomposes. The lime, the magnesia, and the potass are acted upon by the carbonic acid of the atmosphere and by water; and the oxide of iron, if in its least oxygenated state, tends to combine with more oxygene. A disunion follows from this internal change in some of its constituent parts, and a thin layer of earth is thus formed. Lichens, mosses, and like imperfect vegetables take possession of this new territory, and begin to vegetate. Their decay affords a certain quantity of organizable matter, which blends with the earthy bed whence they grew, and lays the foundation of a more improved soil. The disintegration still goes forward from the action of air and water; and the grasses next appear. These begin to absorb nourishment from the unformed elements around them; and their annual decomposition accumulates still more vegetable mould, till at last, by a gradual process, the soil is deepened and prepared for the reception of forest trees.

It is obvious, that all soils will consist of more or less of the four earths, in proportion to the quantities of them existing in their native rocks; and that the character of the latter will stamp that of the former. A sandstone will produce a poor and hungry soil, which, unless improved by artificial means, will remain forever with a scanty covering of vegetation; while chalk, basalt, calcareous sandstone, or limestone will break down into ingredients naturally so fertile, as to be soon beautified with the perennial grasses, and when ploughed up, to afford a rich bed for the *cereal gramina*.

But to return from this geological disquisition, on which I entered to describe the means employed by nature in the formation of the ter-

restrial surface, I remark, that our upland consists, partly of silicious or sandy soils—and wherever these occur, they pass under the well known name of barrens; partly also of some pretty large tracts of clay, diversified both as to texture and colour; but chiefly, of loam—the best and most valuable of all uplands; because as was previously explained, it it compounded of the original earths, by the union of which all the purposes of vegetation are most effectually promoted. These are several patches of sandy soil, which border and intersect the great Pictou road, before you reach the Stewiack bridge, of so bleak, waste, and desolate an appearance, as strongly to portray the unproductive character of this earth, which is invariably marked by a stunted and unhealthy coppice. In by far the most of Aylesford, sand predominates in a much higher degree than in any other township of Nova-Scotia; and the vegetation throughout this tract, and particularly on the sides of the great road to Annapolis, bears certain and unequivocal indications of this peculiarity.

Of clay upland we have a great variety; and it is fallen in with on the different rivers that empty themselves into Pictou harbour; in the neighbourhood of the Shubenaccadie; at Musquodoboit; and considerably between Liverpool and Shelburne. All these, however, are insignificant in extent, when compared with our loams, which are distributed in rich profusion all over the Province, and yield abundantly whatever kind of corn is sown upon them. I am not possessed of that minute local knowledge, which would enable me to describe their general and characteristic features, as exhibited in the different townships and counties; but many of them, which I have seen and examined, are open and fariable; a few are close and tenacious from the prevalence of clay; and all of them inclined to a hazel hue. These loams require nothing from the cultivator, but to be cleared of their woody incumbrance, and torn up with the plough—in order to reward him with the most luxuriant crops; and generally speaking, it will be found that the produce of the first year reimburses all the outlay of improvement.

Interval in this Province is generally applied to those fertile levels, which lie along the banks of our rivers, and have been formed in the lapse of past ages, by the gradual deposition of the waters, when they burst their boundaries in Spring and autumn. During every *freshet*, as it is here called, a thin layer of fresh earth is spread upon the surface, and which has been washed from the higher ground by the rains or melting of the snows. Our intervals, therefore, are composed of successive coats of very fine sediment laid over each other, and as water only holds in suspension the minuter particles of clay, sand and lime, these soils from the very nature of their formation must be free from all bulky and coarse materials. But they have an additional advantage which gives them a sort of artificial fertility. As they are of alluvial origin, the ingredients, which enter into their composition, must be taken from all the primitive earths. The muddy and turbid torrent, that overflows its banks, has been swelled by all the tributary

streams it meets with in its passage; and these again, when traced to their sources, resolve themselves into the insignificant rills, which come trickling down the mountain, or creeping through the valley. One branch rolls onward with a mixture of clay; another with that of sand; and a third, perhaps, which flows through a limestone district, adds the contribution of calcareous earth. The turbid volume of the waters, when thus collected and meeting in one channel, is impregnated with all the component parts of soil: and as it gradually and slowly deposits them, it forms a rich fine bed along its whole course, wherever it can diffuse itself into sluggish stagnant pools. Such is the origin of our intervals: and such the course of their superior fertility. All of them, however, are not of the same happy contexture: and this may be accounted for, from the predominance of some one of the primitive earths throughout the tract of country, whence the river takes its rise. The intervals of the Stewiack incline to the sandy; and this can only be ascribed to the prevalence of that ingredient in the uplands which feed it; while those on the Shubenaccadie are much heavier, from the intermixture of clay; because some of its branches pass through various argillaceous beds in Douglas, and in the neighbourhood of the Lakes.

The overflow of the rivers is not only the primary cause of the existence of this class of soils, but also the immediate source of their permanent fertility. The waste occasioned by the crop in repaired by the new deposition of the next flood; and nature seems thus to have secured their inexhaustible richness by periodical renovations. These lands cannot be easily worn out; and in such estimation are they held here, that the price of every farm rises or sinks according to the quantity of interval attached to it. These illustrations lead us fully to understand the wonderful accounts given us in history about the overflowing of the Nile, and the public anxiety entertained at Cairo, that the inundation should reach a known height. They explain also, why India has been able, since the most remote antiquity, to sustain an immense and overwhelming population. It is a country abounding with interval land formed by the annual inundations of the Indus, the Ganges, the Brehampootre, the Euphrates and the Tigris—rivers of such magnitude, both in the length of their course and the bulk of their volume, that when they swell and break over their banks, some of them resemble an inland sea, and in many places extend from side to side upwards of an hundred miles.

Sea Marsh in Nova-Scotia is presented to us in two forms; either with the tide covering and leaving it alternately, or embanked so as to keep the surface dry. In the first state, it is of little value, producing only a very coarse herbage; in the second, it is the richest of all soils. It must be plain, without any laboured detail, that while the sea is suffered to flow in and out without any interruption the land cannot have the benefit of tillage, and no crop can grow there, except such aquatic grasses as are congenial to the situation. There is no employment of capital, which would yield so great a return to the public, and to the individuals, as the dyking of these Marshes: and no pains

should be spared to unite in such schemes the adjoining proprietors who have a common interest. The ignorance of some, the backwardness of others, and the poverty of all—which last is the child of their laziness—are powerful obstacles in the way of success; but such is the paramount utility of these undertakings, that the wellwishers of the Province, and the patrons of Agriculture, should persuade, soothe, flatter, and cajole them into one system of zealous and active co-operation. We have thousands of acres capable of being reclaimed from the ocean, chiefly on the Bay of Fundy, its creeks, and inlets, which, if dyked and cultivated, would bring great accession to our internal prosperity, as well as to the private emolument of the undertakers. I know only of two works of this kind going forward on an extensive scale within the precincts of the Province, and both are in King's county.

Dyked Marsh is the most valuable, the richest and most productive of all soils: and upon turning our attention to its origin, we shall soon see the cause of this decided superiority; and it will tend still further to exemplify and confirm the general doctrine. The sea is the great receptacle of all rivers, and consequently, of both the soluble and insoluable matters which are suspended or rolled forward in their waters. What is not deposited in the intervals along their banks, is carried to this vast abyss, and settles at the bottom. The actions of currents, and the unceasing motion of tides agitate and disturb this slimy mass, and thus diffuse it equally on all sides; but at the mouths of the rivers, it will accumulate to the greatest thickness, and consists exactly of the materials which are brought down the stream. The fresh waters there meet with resistance, and are, in a great measure, arrested in their progress; and during the temporary stagnation thus created, the insoluble matter subsides most rapidly, and forms a richer and deeper bed. Fishes, too, of various kinds are constantly dropping excrementitious matter; or are themselves submitting to violence, and passing into a state of dissolution, and thus both while living and dead, contribute to the enriching of the soil. A variety also of aquatic plants are in a perpetual state either of growth, or decay; and their decomposing matter is blended with all the other elements into one heterogeneous mass. If we suppose the process to be continued for 2,000 years, during which our Globe, from well attested documents, has undergone no material physical revolution, we can easily explain the acknowledged excellence of Marsh, when redeemed from the ocean, above all other soils. As if nothing should be deficient in its composition, the shells, which grew there and perished, are intermingted throughout the whole stratum, and by the action of their calcareous efficacy, administer the last and finishing ingredient to complete its superiority. To sum up these facts into a general view: SEA MARSH is a compound prepared by the laws of Nature of the insoluble and fine particles of sand, limestone and clay carried by the rivers from the dry land, mixed up with the calcareous earth of shells, and enriched by the putrescent remains of the vegetables and animals which lived and decayed on it. It is so fat, that in many

parts of this Province marsh mud is employed as a manure, and is experienced to be highly beneficial on many of our uplands.

There is thus a natural order of fertility dependent on the laws of the universe, according to which soils are arranged, before they are appropriated by man or subjected to his culture. At the head of this order stands confessedly SEA MARSH, next FRESH WATER INTERVAL, then LOAM, and towards the foot, CLAY and SAND. Of these two, clay is the more valuable, because it is capable of being improved by certain processes performed on itself; whereas sand is absolutely unfruitful, till it be mixed with some tenacious and binding materials, which generally must be transported from a distance and at a very great expense. Besides these kinds of soils—the only ones we have in this Province—there are calcareous and chalky to be met with in England and several parts of Europe. These are well adapted for every species of corn, particularly for the production of wheat; and in the order of fertility they should occupy the space between the Loam and the Clay: but it is of no use to assign any reasons for this particular station, because, as far as my knowledge goes, they exist not within the limits of Nova-Scotia.

It is a matter of course, that the order of occupancy in a new country should obey precisely, and follow the order of fertility: and this view of the subject will both strike out new lights, and suggest some practical applications. The coast of the Bay of Fundy is unquestionably the garden of Acadia; and accordingly, we find that the French planted themselves there, on the first occupation of the country. They threw across those dykes, and *abateaux*, by which to shut out the ocean, that they might possess themselves of the rich marshes of Cornwallis and Horton, which, prior to our seizure, they had cropped for a century* without the adventitious aid of manuring. The progress they had made, in the clearing of the interior, was small; but wherever they did encroach on the forest, it was in the line, and by the banks of the rivers, that they might lay hold of the intervals.

Since we took possession of the country, we have followed exactly the same general rule of occupancy. The marsh lands were all first taken up in grants, the sides of the rivers next in succession, and now the loams are in request, especially those that skirt our roads, or lie in the second or third division of our old settlements. Whenever a piece of bad land obtrudes, that is, stiff clay or loose sand, which is always indicated by an appropriate growth of timber, it is passed over, till it acquires value by being surrounded with cultivation. To say that men are governed in this choice by interest is a trite, but not a philosophical explanation of their conduct. The agricultural produce of every country comes to settle at a price which is compounded of the rent paid to the landlord; of the profit of stock laid out in seed, in implements, and in cattle; and likewise in the maintenance of the cultivators. In this Province no rent is paid, which in all European countries consti-

* See Governor Lawrence's Proclamation of 1759, published in last Recorder.

tutes a third nearly of the gross produce; and the price, therefore, of grain, depends on the other two elements of the computation, namely, the profits of stock, and the support of the cultivators. When population is scanty, labor, of necessity is dear, and every man in settling on and must select, what is capable of improvement at the least expense, with a view to bring his produce to market on as favourable terms as his neighbours, who had before him a prior choice. Stiff, cold clays, sandy barrens, or swampy grounds that require much draining and expense, cannot, in the present state of the Province, be at all cultivated with profit; and our progress in the arts of life must be considerably advanced, before it would be judicious to vest capital in such projects. Even in old countries which have a dense population, and all the accompanying advantages of great demand and cheap labour, there are lands remaining in their original rude state, not from any indolence or inactivity in the proprietor, but because, when improved, their value in the market would not be equivalent to the necessary outlay. As the human race multiply, and the better soils become inadequate for their subsistence, the plough and the spade successively approach those barren spots, which in an earlier stage could not be touched; and the progress of cultivation over the unproductive soils exactly keeps pace with the growing wants of the Society. In China, even the summits of the mountains are not suffered to lie waste; and it is no unfrequent sight to see the wretched natives toiling up the steep under a basketfull of earth, with which to cover the naked bosom of the rock. The low lands are so thickly occupied, and their produce in such requisition, that the new generation of beings pressing into existence must either starve, or seek their food in the cliffs and hollows of these elevated regions.

In a colony, such as this, which labours under a want of capital, should it so happen, that all the lands of first quality are held under grant by occupiers, who make no effort at improvement, and of course do not provide the means of increasing the population, and, in this way, of lowering the price of labour; and should those of the second or third description only be in the gift of the Government, new settlers are as completely debarred from the country, as if an Alien Act were in efficient operation. But to pursue this subject, in connection with the fundamental maxims of political economy, would force me to wander into a labyrinth of discussion, for which I fear my readers are not yet ripe, and which will come more naturally forward in some after part of my course.

Halifax, Oct. 21, 1818.

TO CORRESPONDENTS.

My other communications to the RECORDER have been so long this week, that I can only return thanks generally to the many gentlemen who have honoured and addressed me.

About this period two circumstances occurred, which tended a good deal to enhance the present interest of these writings, and exerted a very important influence on their future success. The theory of climate on which I had expatiated at some length, but which in reality offered no new views, attracted the notice of some gentlemen, who began, in one of our weekly newspapers, to question the truth of it, and to dispute the arguments on which it was founded. The general conclusions I have drawn in favour of the climate of Nova Scotia, and of its capability to perfect all sorts of grain, struck at the root of a very dangerous but popular opinion, which had gained a too ready assent among most classes of society. It was believed, that the country was destined by nature for pasturage; and that all attempts to raise bread for the growing population must be fruitless and unavailing. The lateness of its Spring, the length and severity of the winter, the frequency of the fogs which hovered over it and obscured the atmosphere, were, one and all, insisted upon as insuperable impediments in the way of the extended cultivation of corn. I had ventured in the face of this formidable array of objections and difficulties, to advance the reverse of the proposition; and all at once my style, matter, and motives were assailed in succession. The most anxious inquiries were set on foot to discover me under my assumed name; several plots for that purpose were laid; dark hints were thrown out, and the attention of the public was wound up to the highest pitch. If opponents came forward on the one hand, defenders equally numerous, and perhaps more zealous, rose up on the other; and a literary war was declared and waged with all the usual accompaniments of violence, invective and abuse. It ended in the complete dominion of that view of the subject which I had fortunately adopted; and so thorough was the conviction in behalf of the climate, that the adherents of the opposite doctrine lost all credit in public estimation, and retreated from the field with some disgrace.

The other favourable circumstance was the plan, which about this time I began to carry into effect, of publishing weekly such important communications as were sent me; and to these I subjoined remarks in which I took occasion to touch on those topics of living and present interest, that could not find a place in my regular and systematic disquisitions.

The appearance of letters from known and respectable characters, who cheerfully lent their aid in furtherance of my views, and who gave much local and minute information, created a prodigious curiosity, induced others to a like correspondence, and placed within my reaeh the available talents and patriotism of the Province. To insert these communications and my remarks in the present volume would swell it beyond due bounds; and therefore, I must omit all of them, except such as record and illustrate the establishment of the several agricultural societies which now started rapidly into existence.

The two subjoined letters published along with my fourteenth essay are a good specimen of my plan, and announce, the first of them, the annual election of officers for the Pictou society that had been

formed about a year before this date; and the second, the institution of the Colchester society, which I hailed with no little triumph as the first fruit of my labours, and the pledge of more extensive and complete success.

PICTOU, October 10, 1818.

AGRICULTURE.

At a meeting of the "West River Pictou Agricultural Society," held on the first Wednesday of this month, being their annual meeting for the election of officers, the following gentlemen were unanimously elected office-bearers for the ensning year:

Edward Mortimer, Esq., President.
The Rev. D. Ross, and Mr. R. Stewart, Vice-Presidents.
Mr. D. Fraser, Treasurer.
Mr. John Bonnyman, Secretary.

After a number of the members had respectively communicated the experiments made during the last season in preparing seed wheat; the best method of raising turnips, and many other useful observations, the Society voted their unanimous and most hearty thanks to the unknown "AGRICOLA"; and appointed the Rev. Duncan Ross to correspond with him in behalf of the Society.

HALIFAX, October 20, 1818.

TO AGRICOLA.

SIR,—Since I had the pleasure of addressing you, very many of the respectable inhabitants of the district of Colchester, whose attention had been called to the subject by your exertions, met at the Court House, in Truro, on the 7th instant, for the purpose of forming an Agricultural Society. They did me the honour, on this occasion, to elect me for President; The Rev. Robert Douglas, of Onslow, Vice-President; Mr. Edward Blanchard, of Truro, Secretary, and Mr. Wm. Dickson, of the same place, Treasurer. They also elected a Committee, consisting of Rev. Mr. Graham, of Stewiack; Rev. Mr. Blackwood, of Halifax road; Mr. James Fleming, of Londonderry; Mr. Thomas Brown, of Onslow.

This Society is designated the COLCHESTER AGRICULTURAL SOCIETY; and the persons who are named, with many others who have taken a warm interest in it, are determined to use their utmost endeavours, both by example and advice, to improve the state of Agriculture in this quarter. If you, sir, are furnished with the rules of the "Hants Agricultural Society," or any other already formed, may I beg the favour of their perusal.

I am, sir, with high regard, your most humble servant,

S. G. W. ARCHIBALD.

REMARKS.

In addition to the above intelligence, my readers will have perceived, in the newspaper of last Tuesday, the insertion of the Quarterly Report of the Hants Agricultural Society. This body is catching the general flame which is spreading through the Province, and I trust will soon give indutiable proofs of a revival of its activity. It is now the only remnant of that agricultural spirit which was excited here 30 years ago, under the administration of Governor Parr, and which, from the want of legislative aid, speedily languished, and well-nigh became extinct. Not a vestige of it remains either in Nova Scotia or New Brunswick, excepting this solitary society, to which much praise is due for preserving the frame of its existence, even although it has outlived the ardour which gave it birth. It stands like a desolated and fractured column amid the ruins of that noble edifice, which was then erected, but erected of too perishable materials. No notice of any kind has proceeded from the Hants Society for many years, and I am truly glad to witness this symptom of reviving vigour which, under proper management, may happily restore the soundness and strength of its pristine constitution. The first Agricultural society in Nova Scotia was instituted at Halifax on the 10th of December, 1789; and soon after, the inhabitants of the county of Hants formed themselves into a similar association, with a view to co-operate with the Capital in promoting Agriculture and rural economy. Much about the same period, in 1790, a society likewise was founded at St. John's, New Brunswick, under the patronage of Lieut.-Governor Carleton; and from the only volume which was ever published here on rural affairs, everything betokened the establishment of an energetic and active system of improvement. These associations however, with this one exception, soon fell into pieces, and all their effects disappeared,—from the new and intense interest which was excited by the marvellous and criminal transactions of the French Revolution, and by the long and sanguinary war which grew out of it, and set an unexpected flow of wealth into these Provinces.

By the failure of these first attempts we must not be too much cast down; and although many predict a like fate to the present appearances, let us make another and a second effort, and perhaps the current of events may favour the enterprize.

I hope we are approaching a new æra in the annals of our Agriculture, and that Nova-Scotia, which has been so long postrate at the feet of the States, and has purchased their produce, at the expense of our circulating specie and our internal prosperity, will shake off her supineness, will arise in the plentitude of her resources, and strain every nerve to draw from the soil wherewithal to maintain her people. The path is straight and open by which to accomplish this end. We have only to enlighten the public mind, with regard to the importance, the legitimate objects, the utility and even the dignity of farming: for I hold it as unquestionable, that there is no other art, in the whole

compass of human ingenuity and skill, which admits of such interesting experiments, of such a clear insight into the laws of matter, of such philosophic contemplation, of such healthy and invigorating exercise, and of such intimate union with all the sciences that ennoble man and exalt him to his just pre-eminence. It is not a mean and pitiful pursuit fit only for the grovelling, ignorant, and untaught class of society. Kings who wore the imperial purple, have held the plough: and the Patricians of the Roman Senate—these Conscript Fathers—the Arbiters of Nations and the Disposers of Kingdoms, disdained not to mingle in the labours of the field. It is past endurance to hear Agriculture—the best, the noblest, the most dignified of the arts, spoken of contemptuously.

The next question is, in what manner is this knowledge—this illumination of the public mind—to be most extensively and most usefully diffused? Clearly, by the establishment of Agricultural Societies throughout the counties and townships; and all other means will prove inoperative and fruitless. These associations were the main spring of all the improvements which of late years have changed the face of the mother country and raised her Agriculture to such an enviable pitch; and here they will work, though more slowly, with equal certainty of effect. It becomes then the duty of every patriot to recommend in his private circle such societies; and the Representatives and Magistrates should unite their common influence and exertions for their immediate establishment. There are several stations obviously pointed out for this purpose by their topographical position; and I hope soon to have the satisfaction of announcing to the public the realization of my most ardent wishes. I recommend, first, a society to be formed and to meet so as to comprehend Horton and Cornwallis; another at Annapolis, to embrace Wilmot, Granville and Digby; a third at Cape Fourchu; a fourth at Liverpool; a fifth at Lunenburg; and two more, at eligible places for the respective Counties of Sydney and Cumberland. These seven, with the three already in operation at Windsor, Truro and Pictou, would be sufficient in the mean time; and would be accessible to every spirited farmer, who was desirous of information, and anxious to contribute his mite to the advancement of the Provincial prosperity. Were the country organized in this manner, and were the Representatives to become members of these associations, an appeal to the Legislature when next assembled, to patronize and incorporate a Central Society in Halifax, invested with certain powers and privileges, would be made under the most auspicious circumstances. In the meanwhile, it is requisite for the country to show itself ripe for this improvement; and the cheering prognostics, in many quarters of the Province, are a demonstration of that general and simultaneous movement which is the prelude of great events. In the Capital there are several individuals who are already promising to subscribe liberally, when the Central Society is instituted under legal sanction; and supporters both of rank and influence will appear for it, who are just now standing behind the curtain, and watching the progress of public feeling.

No. 15.

ON SOIL.

AFTER having travelled over so wide a field of illustration, in the course of which I have touched on many topics of interest and instruction, I now approach the last and most important point in the second section of my plan. If my readers have been at all attentive to my strain of argument, and made themselves masters of the multiplied views I have exhibited, they will find no difficulty in appreciating the fitness and efficacy of the remedies which I am about to prescribe, in order to rectify the natural defects, and conquer the untoward qualities of different descriptions of soil lying within the bounds of the Province. It is only by having recourse to first principles, and laying them down in order and with precision that any thing like system can be introduced into the practice of husbandry; and the advantages of this, when grounded on experience and placed under the direction of this faithful and unerring monitor, are manifold and apparent. There should be nought like quackery in Agriculture—no authoritative tone of dictation to the farmer without assigning satisfactory reasons for the practice recommended: for this profession is not a piece of patch work, made up of arbitrary rules and doubtful maxims handed down immemorially from father to son, but it is a science, which walks hand in hand with philosophy, and takes the full benefit of her lights, and which disdains to command, till it informs the understanding.

I need make no apology for taking a slight retrospective glance of the leading doctrines I have delivered on Soil, in order to comprise them into one view, and set them, as it were, before the eye of the mind in a conspicuous and impressive attitude. I have said, that the soil serves three purposes in the process of vegetation: it furnishes a bed in which the roots expand themselves, in order to give firmness to the stem, and collect the necessary nutriment; it is the laboratory in which putrefaction goes forward, and it has the capacity of fixing and absorbing the gasses or streams set at liberty during decomposition; and it also chiefly supplies the moisture to the plants which live and grow upon it. To answer these ends, Nature must have either formed the mould, which, like a robe, invests the habitable Globe, of a triple and corresponding character: or she must have spread and blended into one composition different materials adapted to these essential purposes of vegetation. She has made choice of the latter plan, and it opens an interesting and beautiful view of design, to mark the qualities of the primitive earths in connection with their subserviency to the vegetable kingdom. To render the surface penetrable by the roots and the smaller fibres, and to keep it open and friable, sand or gravel are provided in such abundance that they prevade both the old and new Continents, and are met with in all countries and climates: to render

it again retentive of moisture, that the plants which vegetate most vigorously in hot weather, might not be parched by excessive drought, clay was thrown into the heap, and blended with the sand: and lastly to render it a fit laboratory for resolving animal and vegetable matter, and applying it to use, lime was added, which assists the putrefaction and also enters into combination with the liberated carbonic acid. Magnesia—the scarcest of all the four primitive earths—serves as a substitute for lime, and is productive exactly of the same effects; but as calcareous earth supplies its place, taking the most favourable view of its efficacy, it is distributed with extreme parsimony, and in most cases, is entirely dispensed with. Here we behold a beneficent adaptation of means to ends in the constitution of the elements of soil, and the purposes of vegetation are promoted by corresponding earths, which are profusely scattered everywhere, and in many places are compounded by the laws of matter, and made ready for use.

If these illustrations be just, every soil is more or less defective in proportion to the absence of one or more of these ingredients, and when perfect and capable of the utmost productiveness, it must arise from a due mixture of the whole. Hence originates a curious question, which has attracted a considerable degree of notice, but has not yet received any satisfactory and definite solution: What is the proportion of the primitive earths, which forms the most fertile soil? To ascertain this with some tolerable accuracy, the analysis of various soils has been undertaken by chemists, and the products of each have been noted and compared. [1]Mr. Tillet, in some experiments made at Paris, found that a soil composed of three eighths of clay, two eighths of sand, and three eighths of finely divided limestone, was very proper for wheat. Mr. Henry examined a fertile corn soil in East Lothian, Scotland, and divided it into 100 parts. Of these, the clay amounted to 45, the sand to 25, the calcareous earth to 11, the vegetable manure to 9, and the water in absorption to 4, and the remaining 6 were taken up in chemical compounds, chiefly the sulphate of lime. He submitted, also, to the test of experiment a soil from Somersetshire, celebrated for producing excellent crops of wheat and beans, and found it to consist of eight ninths of calcareous marl—a compound of clay and lime—and one ninth only of sand. [2]Sir H. Davy discovered, that a soil, containing eleven parts out of twelve of sand, could yield a tolerable crop of turnips; but, if more sand was added, it became absolutely sterile. From these opposite results this legitimate deduction may be drawn, that the productiveness of the earth does not depend on any exact proportion of the primary ingredients, and that a very great latitude is allowable in their composition; and this is analagous to that law of variety which is observable in other arrangements, and seems to govern all the operations of Nature. It cannot however, be denied, that this remark applies more particularly to the clay and sand—the two princi-

1—Henry's Chemistry, page 426.

2—Farmer's Magazine, vol. 16 p. 482.

pal ingredients—which from the above experiments may be mixed up and assorted from one ninth to eleven twelfths: that is, a soil may consist of clay except a ninth part of sand, or of sand except a twelfth part of clay. These two extremes so wide of each other, leave a vast intermediate space to be filled up, and account for the almost infinite variety of loams—truly productive—that are met with on our globe. But lime must not be introduced into the composition of soils with the same freedom of admixture. Its beneficial qualities are only exerted when a moderate dose is applied; and it is universally pernicious when existing in excess. Magnesia is equally, and in all probability more so; for many are of opinion, that it acts even in the smallest quantities as a poison to vegetation.

These views will be found highly conductive to the right understanding and judicious application of the remedies, to which the farmer should have recourse in rectifying the defects of any field he is solicitous to improve. He has only to inquire, which of the original ingredients is wanting, and then endeavour to find it at the easiest and cheapest rate: for he may be assured, that the utmost fertility is unattainable without the presence of all the elementary substances.

Under the guidance of these conclusions, and aided by the lights which they afford, I shall proceed to examine shortly all the descriptions of soils found in Nova Scotia, and appropriate to each a few practical observations.

1. *Marsh*, the formation of which was explained last week, is compounded of all the primitive earths, and is confessedly the best of all our soils. It requires to be embanked against the ocean, that it may become fit for tillage; but in all other respects it is placed beyond the help and operations of art. The ingredients are so happily mixed, that any attempt to modify them would be injudicious tampering, and as likely to issue in its deterioration as its improvement. I am far, however, from the belief, that it can be cropped for hundreds of years, without impairing its natural productiveness; and all our ideas of a perpetual fertility, independent of fresh supplies of animal and vegetable matter, are mere chimeras of a speculative imagination. Every successive crop vegetates at the expense of the decomposing dead substances in the soil, and draws from them its strength and nourishment. The original store, therefore, must become exhausted in proportion to the number of years the land has been under cultivation, and if these be extended to an indefinite length, the inevitable consequence must be, the extraction of the whole nutriment. In conformity to this hypothesis, it has been found, that the rich meadows in America, which were supposed to contain the elements of an inexhaustible productiveness, have been much sooner worn out than was expected, and thus blasted the idle and unsubstantial hopes of visionary projectors. The same result must follow in Nova Scotia, if our marshes are laid under an uninterrupted course of cropping, and neither renovated by the application of manures nor repaired by lying in pasture. To this conclusion experience has now brought an accession of strength, and the

diminished produce of these fine levels is an incontestible evidence of the erroneousness of that theory which has been set up in despite of the first principles of vegetable nature. True it is, that some of our marshes, and I believe spots in the *Grand Prairie* of Horton may be instanced as an example, have been under wheat and grass alternately and in succession, for more than a century past, and have not been replenished during that long period with any sort either of fossil or putrescible manure; but the fertility is here preserved by the uniform practice of laying out these marshes to grass, and keeping them so for several seasons. Norwithstanding this interval of rest, which to a certain extent recruits all soils, the produce of our best marshes may now be estimated at from 12 to 15 bushels, which is not the half they once yielded, or would again yield, were a different system of management adopted by giving them a certain portion of the barn manure. This is the genuine and substantial food of vegetables, and on nothing else will they *fatten*, if I may be permitted to borrow this term from the animal economy. It is pitiable husbandry to extract from such excellent lands these diminutive and insignificant crops.

II. The fresh water intervals are our finest looms; because the clay and sand of which they are formed have been blended by the deposition of the floods, and consist altogether of the minutest particles of each. I am satisfied, that the application of lime to these would be of incalculable benefit, as furnishing a quickening and stimulating substance, which would assist putrefaction, and serve to fix and absorb the fructifying gasses. Some of them, I am certain, already contain a portion of calcareous earth brought down by the torrent; but in none of them which I have examined, does it exist in sufficient abundance to exercise its full activity; and all of them would be greatly improved by the use of this excellent and valuable fossil. Too great a dose in the first instance need not be given; and although the expense of 60 or 80 bushels per acre swells into magnitude in the eye of a farmer, he should recollect, that the benefits of liming are permanent, and are felt for thirty years afterwards. Lands have been limed in Scotland at the rate of three hundred bushels per acre.

III. Upland loams are exactly formed of the same materials with interval; but the mixture is not so complete, and the parts are of a coarser and bulkier description. The loams generally in the Province are inclined more to sand than clay, and on that account are admirably adapted to the turnip husbandry. By tillage they could be pulverised into a fine soil capable of producing all sorts of green crops—and I hope the period is not very remote, when their capability shall be put to the test. Lime would be a great and beneficial improvement to them all, as it is the only ingredient wanting to complete and perfect their composition. The quantity that should be laid on, must depend on many circumstances, so that no rule which I could prescribe, would be of general applicability, and I fear the expense of burning and transporting it will operate with most farmers in making them lean too much to the safe side. When the practice of lining was

first introduced into Great Britain, which is only about 70 years ago, the tenants of those days proceeded with great caution, and harrowed in a very inconsiderable quantity; but afterwards, when its beneficial effects were palpable and acknowledged, they advanced with more boldness, and applied from 150 to 250 bushels per English acre. The luxuriance of the succeeding crops justified their most sanguine expectations, and quickly repaid this vast outlay. This success encouraged to farther efforts; and many of them laid on a second time as large a quantity as at first. But this after-dose was not accompanied with the same striking advantages, nor offered so sure a prospect of remuneration. Some tried a third, but this was followed by no sensible improvement; and in general the capital expended on the second and third limings was never replaced; and in many instances, a visible deterioration in the productiveness of the soil was the unfortunate consequence. This experience corrected the hasty conclusions drawn from the first attempts; and it is now a recognized maxim in British Agriculture, that an overabundant dose should be cautiously guarded against, but that it is perfectly safe, and highly beneficial, to apply it to the extent of three or four hundred bushels, and in some few soils of stiff clay, in a greater quantity, though not all at once, but the one-half at an interval of a complete rotation of crops. I conceive, there is no great difficulty in assigning the cause of this disappointment. Lime is one of the original ingredients of which a perfect soil is composed, and an excess of it as well as of any of the others must be a defect, upon those principles which have been already illustrated; and as only a very small portion enters into the organs of plants and is necessary to the constitution of their fibre, perhaps the soil should contain only a quantity proportional to the wants of vegetation. Whether this be the philosophical explanation of the difficulty is of immaterial consequence; since the fact itself is certain and undoubted, and has led to a more temperate and guarded use of calcareous earth.

Further, it may be applied to our loams either in the shape of quicklime as it comes from the kiln, or in that of a carbonate, as pounded limestone, marl, marsh mud, or in short, any modification of it found in nature. Quicklime is so easily pulverised, and in that state capable of so intimate and close an union with the soil, that a preference is naturally given to it in the general system of farming; but marl may be used as an excellent substitute, and with almost equal success. Through the medium of one of my correspondents, I am in possession of a specimen of very fine marl taken from Mr. Cunningham's lands in Windsor, which would form a valuable manure for light and common loams. The value of marsh mud on uplands is derived from a variety of circumstances, which combine to render it a capital manure; and too much attention cannot be paid to this great and inexhaustible store of agricultural riches. To sandy loams, it supplies a quantity of clay which they need, in order to acquire tenacity and adhesion; to poor and worn-out soils, it becomes a valuable dressing from the remains of animal and vegetable substances incor-

porated it its formation; and to all uplands, it affords a quantity of lime—from the disintegration of calcareous rocks, particles of which have been washed into the sea by the ceaseless action of torrents,—and from the decomposition and gradual destruction of shells.

IV. Sandy or gravelly uplands in the present state of this colony, are hardly worth cultivation: for it is egregious folly to waste capital on unproductive barrens, while there remain in a state of nature, and unappropriated, such vast tracks of improvable loams; yet as the general principles which I have laid down are applicable to all soils, and as some sandy patches are comprehended within the limits of our cleared settlements, it may not be amiss, briefly, to chalk out, with regard to them, the obvious line of procedure. What they want is a binding and tenacious substance—retentive of moisture—and clay in this case presents itself as decidedly the best manure. We previously mentioned, that eleven parts of sand with one of clay would constitute a soil that would yield a tolerable crop of turnips; and therefore, to spread over the surface half an inch of clay, and afterwards to mix it up with the soil to the depth of six inches, must effect the cure of its barrenness. A greater proportion would be desirable; but this is the least at all consistent with fertility, and if to this mass so compounded, were added clayey marl, and dung, it might be brought slowly to a productive and vegetative mould. It was the adoption of this method that laid the foundation of the Norfolk husbandry, so justly celebrated in Young's Eastern Tour.[1] That county in England, before the middle of the last century, was a wide and worthless tract of sand, rented only, as sheep-walks, at about 1s. 6d. per acre. It possessed one natural advantage, to be found perhaps no where else in an equal degree: its subsoil consisting of a white and yellow marl or clay. On the first discovery, the farmers spread this in large quantities, many of them at the rate of 80 loads per acre, and afterwards they reduced it to 40 and 60. The benefit of this first layer lasted for thirty years, and then half as much more replenished the exhaustion. Rents rose rapidly to twenty shillings per acre; and this mixing of clay with sand gave rise to a particular routine of cropping—known by the name of the Norfolk system, which we will afterwards take occasion to explain. The fact is, that wherever Nature has not blended the three primary ingredients of soil—sand, clay and lime—it is necessary that the deficiency be supplied by the operations of man.

V. Clay, in its unsubdued state, is the most barren of all soils, and requires more than any other an expenditure both of capital and labour. It may seem paradoxical to recommend the laying of [2]sand on this stubborn earth, but wherever it can be easily procured, it is the most certain and infallible remedy, and will much sooner work the effect. About 14 years ago, in another country, I rented a small field, which consisted of a friable loam, except one corner, where protruded

1—Bath Society Papers, vol. 1, page 19, 20.

2—Young's Calendar, page 43.

on the surface a stiff and unyielding clay, which had proved so obstinate to the former occupiers, that they had given it up in despair, and it was accounted hardly worth seed and labour. Previous to my possession, it had been limed and manured, and more than once subjected to a naked fallow, and still its refractory nature refused to be tamed, though rich in calcareous and decomposing matter. About this period I recollect, that Millar's Dictionary on Gardening and Agriculture fell into my hands; and under the article Earth, which any of my readers may consult at their leisure, he recommends sand as an efficient manure for fat borders; and stated that the gardeners about London were in the practice of using it, to restore the virgin temper of the soil in lieu of trenching; and also that it would prove useful on "clays, to open the pores, give freedom to the circulation of the sap, and make way for the extension of the roots." I formed at once the determination of making the experiment on my barren corner, and proceeded to cart *dead* sand from the pit, and spread it on the clay about the thickness of an inch, mixing it well with the whole soil. A sagacious neighbour of mine was highly tickled at the oddness of my conduct, and jocularly rallied me on converting a sand pit into a dung yard. This application, however, wrought like enchantment; and to his confusion, and my own astonishment, the crop surpassed all expectation, and was fully equal to what grew on the other parts of the field. The cure was complete; for ever after while under my management, that piece vied with the rest in native productiveness.

From all this reasoning it seems deducible, that *sand* and *clay* in almost any proportions, with a quantity of *lime* laid on with judgment, but not in excess, constitute the best and most fertile soil; and that the only mode of improvement is to supply whatever sort of these original and elementary ingredients is deficient in the composition. But all this will be far from bestowing lasting fertility, unless to the mass be added decayed animal and vegetable substances, which unquestionably minister to plants their principal food and nourishment.

Halifax, Oct. 21, 1818.

No. 16.

ON AGRICULTURAL MACHINERY.

IN the first ages of society the instruments of husbandry were simple in their parts and inartificial in their construction; and the handling of them was accounted mean and discreditable—derogatory to freemen, and fit only for slaves. While things continued in this state, little ingenuity would be directed towards the improvement of those in common use, or in the invention of others of a more complex and effective make. The opening of Ancient History presents us with Agriculture in this lamentable and forlorn condition—its practical followers reduced to servitude and its apparatus of clumsy and unskilful workmanship. Sparta, that renowned republic, which disputed so long the pre-eminence of Greece, applied her whole genius to the art of war, and intrusted the culture of her fields to the Helots—an abject and debased race, from whom were withheld all the rights of liberty. The other States copied this pernicious example; and although there was amongst them a considerable variety of national manners, they all trained their youth to the practice of arms, as the only honourable profession; and doomed their slaves to the labours of husbandry as compatible with their political degradation. Their *ploughs, from scarcity of iron, were made of wood; and barley was the first grain which they raised as the ordinary food both of men and horses.

Among the Romans, Agriculture, from the first foundation of the city, was held in esteem, and seems to have been practiced by all orders of men in the Commonwealth. The severe manners of these ancient conquerors of the world were extremely favourable to foster that patient industry, and rugged habit of labour which are essential to this occupation; but their implements were of the simplest and most imperfect kinds. The plough retained its original shape amid all the fluctations of their fortune; and the classic grounds of Italy were turned up in the same manner, after the tide of conquest had poured upon her shores the riches and magnificence of the East as in the times of Cincinnatus the Dictator, and of Tarquin the Proud. It had only one handle, formed of crooked elm, into which a †beam was fitted, eight feet in length; and to these were added a double mould-board, and a share-head with two backs. After the fall of the empire, and during the ages of barbarism which succeeded from the sixth almost to the fifteenth century, there are only a few incidental traces left of Agriculture, and from these scattered gleanings no correct estimate can be formed of the state of this art in the different European governments. At the revival of literature the plough, having still one crooked handle, emerges from the gloom, and leads us to presume that it had continued, during that long interval of darkness, with scarcely

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*—Rutherford's Ancient History. Cap. 12th.

†—Virgil's Georgics, Book 1st.

any alteration, and certainly with no improvement. The other implements of husbandry were equally imperfect, and their number appears to have been limited to the unwieldly harrow, osier hurdles and a cylindric roller—all borrowed from the Romans, who universally extended with their arms the useful and ornamental arts, and thus atoned, in some measure, for their violence and injustice by the diffusion of knowledge and civilization. The savage hordes, who issued from the North and the East, were too unlettered to attempt any innovation on the husbandry which these elegant conquerors had established, and, in general, they held the pacific arts in too much contempt to bend the severity of their manners to these pusillanimous pursuits. Content with subjecting to slavery the inhabitants they found in the Roman Provinces, and caring little for the preservation of what tended either to the comfort or refinement of life, they left their slaves, or villains as they were soon called, to cultivate the earth after the fashion of their forefathers, but seized with unsparing rapacity the products of their labour.

Without prosecuting this history further, I shall just remark that in Great Britain, Fitzherbert, Platt, Sir Richard Weston, Hartlib and Evelyn were the first writers who inspired their countrymen with a desire to revive the study of Agriculture, and they were followed by the famous Juthro Tull, a man, who though whimsical in some of his speculations, laid the foundation of the drill husbandry, and the numerous improvements to which it gave rise. His labours were incessant and unwearied, not so much to amend the old as to invent new instruments; and, although his theory be now exploded in consequence of the increase of chemical science, still his practical details enter into the modern system of management, and prove a lasting memorial of his sagacity and discernment. He believed that the fine particles of terrestrial matter constituted the food of plants; that manure served no other purpose than to divide it minutely; and that the practitioner, therefore, should have no other object in view than to pulverize the soil, and, if possible, reduce it by tillage to an impalpable powder. Under the influence of this opinion, he set about improving the construction of his Agricultural Machinery, directed his attention to the expertness and dexterity of his plough-men, levelled his ridges, drew his drills in straight lines that he might more readily break and loosen the soil between the rows; and thus, as he supposed, supply to the roots the fine particles by which they were nourished. Since his time juster views as to the food of plants have succeeded; but his practice of pulverizing the earth cannot be too highly praised; and a farmer, versed in the modern theories, may still derive considerable benefit from the perusal of his work. It is the production of a great and original mind, bursting impatiently the trammels with which he felt himself enthralled, and boldly daring to strike out a new path at utter variance with all that had preceded him. The singularity of his reasoning attracted much notice, and led to those alterations in the form and make of the different instruments, which have exalted modern

husbandry so much above the ancient. There is perhaps no country where this taste has been carried out to a greater length than in England; and the number and variety of new machinery which, during the last century, has been brought before the public and recommended in different writings, have been great beyond all parallel. Many of these, it is true, have only enjoyed a short-lived reputation, because they have been succeeded by others superior in structure or cheaper in purchase; yet all of them had a certain effect in producing a powerful excitation of general enterprise, and diverting the efforts of ingenious men into this walk of invention. The state of Agriculture in any community may be safely estimated by the request in which new and more effective instruments are held, for wherever it is despised or neglected, the farmers content themselves with the clumsy and unskilful machines which chance or custom have brought into use; whereas, if it be progressive and straining at perfection, a demand is created for whatever discoveries and means may accelerate its advancement.

Should these letters be fortunate in promoting the establishment of societies throughout the Province, and in stirring up a spirit of internal improvement, the first visible effect will be the appropriation of funds, contributed by the local Associations, and placed under the direction of the Central Board in Halifax, to import, as models, all the various instruments of latest and most improved construction. There is no symptom of more ominous aspect in the present state of our husbandry, nor anything which more clearly marks it depressed condition, than the want of those common instruments which every farmer possesses in England, and which are conceived essential to his success. A weeding-plough, a cultivator, a grubber exists not in Nova Scotia; and, in all my peregrinations, I have not met more than once with the double-moulded plough for the drill system, and that with immovable earth boards, and but seldom with the roller. To expect wheat for the subsistence of our population with such execrable husbandry is outraging the laws of Nature, and waging war with Heaven. The fine crops, which so often bless our indolence, owe nothing to our skill, but are the gifts of our superior climate and most productive soils. The same labour and machinery in Great Britain, with her present immense population, would terminate in famine, and all its concomitant horrors. It is time that we should know the different instruments which are now universally employed in modern practice, that we may compare them with those in use among ourselves. A brief description of these shall now occupy our attention, and as I shall both praise and dispraise, sometimes condemn with unqualified reprobations, and at others freely recommend, it may be proper to introduce my readers to a knowledge of the principles on which my judgment shall be founded, by which they may be enabled to accompany me in my critical investigations. With this view, I shall devote this letter to explain the uses which agricultural machinery serves in preparing the ground for vegetable production; and these may be reduced under the four following heads: It serves to breaken, loosen and pulverize the soil; to destroy

the remains of the pre-existing crop, and extirpate weeds; to bury both seeds and manure at proper depths; and lastly to level all inequalities, and make way for the drill and horse-hoeing system.

1. The use of machinery is to break and pulverize the soil. The earth from its own gravity naturally settles down to a hard, compact and impenetrable body. While in this state the roots of plants—which are the collectors of the food—cannot find a free passage, nor overcome the continued resistance. The activity of vegetable life may push them a little from the main stem; but they can neither ramble at large nor draw the same copious supply of nutriment. When we trace roots to the boundary of their range, we are struck, both at the distance to which they travel and at the obstacles they surmount. Mr. Peters, President of the Blockley and Merrion Society, states that a grain of wheat, if planted in a mellow soil, will strike its fibres three feet downwards, and elongate them much further horizontally. The roots of oats have often been discovered at eighteen inches from the stem; and those of turnips, which, with the exception of the bulb and tap-root issuing from it, are all slender flexible threads, having diverged on all sides to the distance of twenty inches. This doctrine may be illustrated in the garden as well as in the field, and in most cases in the former, with greater effect; because there the cultivation is superior, and is carried to a greater depth. The fibres proceeding from an onion are of a white spongy substance, and are distinctly discernible in a black mould: and these have been found to descend fully two feet in a trenched soil. The carrot will often measure from twelve to fourteen inches; and the fibres which feed it must have sunk much deeper. The potato will push out leaders to the distance of fifteen and eighteen inches in a sandy open loam, well stirred with the hoe. These facts lead irresistibly to the conclusion that the skilful cultivator should prepare the soil for the utmost extension of the roots, and should employ such instruments as will pierce it deeply, and crumble it to powder, for the free and unrestrained passage of the radical fibres. If the ground be ploughed only three inches deep, the roots can descend no farther than the share and coulter have gone before them; and if a tangled sod of grass be merely turned over without being broken and pulverized, they will find vast difficulty in stretching themselves through this matted net-work. The same observations will apply if the surface be encumbered with unsubdued and unbroken clods. The roots will be unable to penetrate their hard coats, and however full of vegetable nourishment, it must be lost, because inaccessible to these dispersed feeders of the crop. The fitness, therefore, of every instrument to break and loosen the soil becomes a criterion in judging of its merit; and its perfection is exactly proportioned to the superiority of its structure for accomplishing this essential end.

II. Another use of machinery is to destroy the remains of the old crop, and extirpate weeds. The term *weed*, in common language, is applicable to all those plants which spring up from their congeniality to the soil and climate, and which are of no value either for use or

ornament; but in the language of Agriculture, everything is so called which extracts nourishment from the earth at the expense of the growing corn. The grasses are pests in a field of turnips; and a potato is mischievous in an onion bed. The manure deposited in the ground is destined exclusively for the support of what is meant to be raised, and every plant, therefore, which lives upon it, is so far noxious and ought to be extirpated. Hence the common maxim: "A farmer should let nothing grow but his crop."

Most weeds can be destroyed by being overturned by the plough, covered with earth, and excluded from the external air. They submit at once to the process of putrefaction, and add to the fertility of the soil which produced them. There are others again, so tenacious of vegetable life that although buried—both roots, stems and leaves—to a considerable depth, they shoot up afresh, and grow with the utmost luxuriance. The common crowfoot, which flowers with a yellow cup consisting of five obtuse petals, and is well known in all our pastures, belongs to this class. It is completely indestructible, though ploughed down, and buried in the ground, and many of our grasses possess the same property. The couch-grass, for instance, propagates by sending from every joint a new stem, and although cut into a thousand pieces, and seemingly destroyed, it will spring anew, if at all within the influence of the solar heat. This last order of weeds can only be extirpated by being brought to the surface, gathered into heaps, and carted off the field. They abound in almost all lands, and harrows of various forms have been constructed to tear them from the soil, and latterly, I believe in the year 1816, a peculiar instrument has been formed for this purpose in Scotland, styled the revolving Brake-Harrow.

The first class of plants and weeds are nearly as troublesome as the last to the farmer; and it comprehends the most of annuals propagated by shedding their seeds, the clovers and tender grasses, and all the corn species. By simple ploughing the green verdure which clothes the fields, is buried to rise no more; and all the plants composing this carpet, with a very few exceptions, ferment and hasten to decay. It is in this way that we get rid of the remains of the pre-existing crop, destroy the cultivated grasses, and kill the new race of annual weeds. The destruction is complete, provided the operations of the plough be conducted with skill and judgment, and provided also, its structure be formed on principles calculated to answer this great and important end. The general rule, which in this case ought to be observed, can admit of a very strict definition, and allows but little latitude in the performance of the work—the furrow-slice, as it is cut and laid down by the plough, should be inverted at an angle of from 45 degrees to 50 degrees; the green side turned downward, and the fresh mould appearing on the surface. Such instruments therefore, and there are many in this province, which set the furrow-slices on an edge of less inclination, and leave a narrow stripe of green visible in the line of their junction, are utterly worthless, and should be universally reprobated. The weeds and grasses spring vigorously

out at this opening; and in a short while the whole benefits of the ploughing are lost: for they rise with the growing corn, contend with it in its progress, and during the whole season rob it of its nourishment.

III. Another use is to bury the dung and seed at proper depths in the soil. If any part of the dung be left exposed on the surface after the operations are completed, it is absolutely thrown away by this mismanagement. There, it mostly passes into aeriform products, mixes with the atmosphere, and is carried off by the winds. Its value is as much annihilated to the owner as if he had tossed it into the neighbouring brook to be borne away by the current; except, perhaps, with this slight difference, that the small quantity of residual earth, which remains after putrefaction, adds to the future fertility of the spot. This is of so small account, that every farmer should be careful in covering up his manure, and conducting his ploughing with the professed design of burying it completely. As it decomposes in the soil, the soluble and volatile parts are absorbed, enter into the roots or leaves, and give vigour and aliment to the crop.

It is no less necessary to cover the seed from the action of the solar rays, as their influence, however they may promote the future growth of the plant, is hostile to the process of germination. During this first stage, it absorbs *oxygene from the atmosphere, and emits carbonic acid: which is the converse of what happens after the leaves expand, and during its whole progress to maturity. On this account all seeds naturally germinate in darkness, and covet not the light, because the leaves, which are the organs of respiration, are not yet unfolded. If seeds however, are buried at too great a depth, they are debarred by the intervening earth from all contact with the external air; and as they cannot absorb by their cotyledons any portion of oxygene, they lie there pent up, without bursting into life. When they are turned up again next Spring, the air gets access to them, and imparts its oxygene; and suddenly they start into existence. It is in this way that a new ploughed field is soon overgrown with annuals, from the germination of the seeds which lay under its surface all the preceding twelvemonth.

IV. The last use of instruments is to level all the inequalities of the ground and prepare it for the drill and horse-hoeing husbandry. In every country Agriculture must remain in its infancy till this system be introduced; and I shall strain every effort to rivet the attention of my readers on its importance, and if possible bring it into general practice. We have a vast extent of ground admirably adapted for its operations, in our marshes and intervales; and even much of our uplands which have been long under culture, and cleared of the trunks, is ripe for the improvement. It will give all these lands a double value, and nearly triple their annual produce. It will force us to train up expert ploughmen, to subdivide and pulverize the soil; to employ care in collecting, and economy in the application of manures,

*Davy's Agricultural Chemistry, page 213.

and last of all, it will provide food for a larger stock of cattle than we now rear, and at the same time produce abundance of bread-corn for the use of the inhabitants. The adoption of this system will be followed by an immediate improvement in our implements of husbandry; by an increased productiveness of the soil; by a flow of wealth into the landed interest; by an additional demand for labour; by a progressive population, and finally by that most enviable of all situations—independence of American supplies for our own consumption.

These four general views, which I have thus shortly exhibited, will become tests by which to try the usefulness and construction of all the agricultural instruments, which are now to pass under review; and the excellence of all of them will depend entirely on their subserviency to answer one or more of these ends.

Halifax, Nov. 4, 1818.

TO CORRESPONDENTS.

Last week I am favored with a good number of communications; and I am pleased to observe that a general interest is excited by these periodical essays. The information, too, given me is of much more importance than at first; and this can only arise from clearer views of the objects that ought to be brought into public notice. The minds of my correspondents are opening apace, and they can both reason more distinctly, and draw juster and sounder conclusions. A great deal of practical detail is contained in several of these letters; and although in some points they are at variance with the mode of good management I shall now in a short time explain, yet in many parts they entirely correspond with it. I am beginning to derive considerable benefit in the elucidation of my Synopsis from these private communications, and I beg their continuance.

No. 17.

ON THE PLOUGH.

THIS instrument, which consists of so many detached pieces, may admit of a considerable diversity in their arrangement, and as the form of these may be endlessly varied without sacrificing fitness or utility, this circumstance affords to invention additional means on which to exercise itself. The structure of ploughs, ever since Agriculture has awakened much attention, and called to its aid the science of mechanics, has become a capital object among the practitioners of the art; and the variety of them, which ingenious and enterprising men have exhibited to the public, and put to the proof in their rural operations, has been so great as to bewilder the judgment, and leave it in suspense as to their comparative excellence and superiority. Most of these, by their respective patrons and admirers, have been praised with the most extravagant encomiums; many of them have enjoyed only a transient popularity; and a few have escaped the common wreck, and outlived their inventors. It is not my intention to trouble my readers with a description of these various kinds; for without plates of reference, it is next to impossible by mere language to represent the proportions, the figures, and the composition of these instruments. Neither, indeed, is it necessary in a country like this, which labours under the want of disposeable funds, and has little to spare on the score of experiment. Our agricultural classes must have surmounted the difficulties of their condition; must have amassed capital, and attained a greater height in general science, ere men amongst them will venture on a range of discovery, and construct implements of curious mechanism to make improvements which are to benefit not themselves, so much as the community. In England, dukes, marquisses, earls, baronets, and all the ranks of nobility emulate each other not merely in patronizing husbandry, but in actively engaging in it: and these patriots known by the name of gentlemen farmers, scruple not to draw from their private revenues the wherewithal to construct experimental machines. Manufacturers and merchants of opulence embark in the same honourable competition; and no scheme is left untried which promises to be useful, or to advance the National Agriculture. It is studied and pursued with an enthusiasm which sets selfish calculations at defiance, and which warms, agitates and interests all the nobler passions of the heart. The peaceful labours of the plough become the amusement and solace of every gentleman who retires from public life, and after he has made his fortune, his imagination pictures no greater happiness than the cultivation of his paternal estate, or the embellishment of the country seat purchased by his wealth, and on which he means to pass the evening of his days. There his pleasures centre, and there his hopes rest. He flies from the din, smoke and bustle of the crowded city, and sits down tranquilly in some sequestered nook, rich in varied beauty, and dis-

tinguished either by the picturesque or sublime, there to enjoy the melody of the grove, the low of cattle, the grateful change of the seasons, the alternation of labour and repose, and above all, that serene and healthful exercise of mind which rural recreations are fitted to produce. It is from such men that all improvements in machinery mostly emanate; while the mere tenant, often struggling with poverty, looks on, an unconcerned spectator, reluctant, in many cases, to avail himself of their successes, even although he runs no risk of their failures. In this province we have few such characters. Agriculture—the grand basis of stability and independence—is abandoned to its fate; the town is preferred to the country; no experiments are undertaken by patriotic individuals for the general good; the superfluous wealth acquired in commerce is transferred to the public funds of England or of the States; our monied men saunter away their old age in listless inactivity, and the "*amor Patriæ*," or love of country never rises to any force, because it is not mixed and identified with the soil. We consider ourselves as strangers and aliens in a foreign land, and will always do so, till cultivation has swept off our forests; has laid naked the genuine features, and brought out the native charms of the landscape, and in short, won our affections by the display of hill and valley; of bubbling stream and rolling river; of grassy mead and tufted upland, and all those natural objects, which link the sympathies and associations of the human heart into the mystic tie, embellished by the poets, and endeared by the name of country. These distressing views account satisfactorily for the inferiority of our Agricultural Instruments, and whisper in my ear to abstain from all curious description of such as are inapplicable to the present state of the art. All that I can attempt, therefore, in these letters will be to point out the uses which the principal parts of the plough serve in the operation of tilling; to notice briefly some peculiar instruments of this sort which have been contrived with the design of heightening and improving their effective power; and lastly to enter into the recommendation of those which should be introduced into this country, and which are indispensible to our success.

The first hasty glance of the plough suggests to the mind that it is a *moveable wedge*, and that all the other parts attached to it are no other than necessary appendages to direct, regulate and drag it forward. This simple idea, abstracted from all utility and effectiveness, conveys most correctly its general nature. The shape of this wedge, its size in length and breadth, the materials of which it is formed, the disposition of all its dependant parts, are circumstances which will admit of considerable modification: but any change in these must be referred to this primary conception, as the criterion of their merit. Keeping its nature as a moveable wedge distinctly in our recollection, we shall be prepared to estimate the usefulness and necessity of all its other accompaniments.

The handles are of no other use than to guide its motion—the iron sock to give it a hard, sharp, and penetrating point—the mould-board

to throw off and turn over the furrow-slice—the coulter to cut the land, and save the waste of animal exertion—and the beam with its notched and moveable muzzle, to regulate and govern the line of draught. In judging of the construction of the plough, the first thing to be considered is, whether its parts in their form and arrangement are calculated to accomplish the end with the least possible friction; and all improvements, which have been attempted on this tool of first-rate importance, have aimed at increasing its effectiveness by diminishing the resistance in its passage through the earth. Its head—or what may be called the body of the wedge—should be straight both on the side towards the land, and on the sole, that it may pass onward without any material obstruction; and the length and breadth of both these should be diminished as much as is consistent with the steadiness of its movement. Every inch of the side and of the sole rubs strongly on the ground; and any unnecessary length or breadth occasions a wasteful expense of the strength of the team. The mould-board which inverts the furrow may either project from the body of the wedge at a sharp angle, as in the old Scotch plough; or in a curved waving line, as in the English. The first of these may be pronounced at once a defective adjustment, as the furrow-slice must maintain a powerful and continued resistance; whereas the other throws it off with more niceness and facility. The sock fitted on the wedge may either penetrate the ground by a sharp point, and tear up the furrow from the bottom by mere violence; or it may be furnished with a feather to cut it off easily, and with little retardation. The beam may be pierced for one coulter, merely to part the sod from the firm land, and throw it off in an unbroken body; or it may be armed with two or more, to cut it into narrow strips before it is laid over by the mould-board. Toll invented a four coultered plough for tilling his ley, or grass lands; and he conceived that material benefit was derived from this contrivance, because in place of turning it over in an entire and firm body, it was cut into four slices, before the sock raised it from the bottom; and thus it was more effectually pulverized. At the end of the beam there may be a simple muzzle, to which the swingle-tree may be hooked; or one moveable on a pivot and secured by a hind-bolt, to raise or depress the draught—with the front divided into notches, to incline the share either to the land or furrowed side. In addition to these essential parts of the plough, there is one other, which in this hurried description ought not altogether to be overlooked: I mean its throat or breast—which may be formed in a straight line behind, and equidistant from the coulter; or it may be fashioned into a gentle bend, widening as it rises, that the danger of choking may be more certainly obviated. It must be apparent to every man of ordinary reflection, who attends to these various parts, and the uses for which they are destined, that the structure of ploughs may be almost endlessly diversified, and that a very great variety may be expected, as a matter of course. To delineate the whole of these would be a vain and useless task, and therefore, I shall only select, and lay before my readers a few

—distinguished either by a happy combination, or some peculiarity, which seems to adapt them for our husbandry.

The Rotherham plough was invented about eighty years ago by Mr. Foljambe, and was accounted then a capital improvemant; because it avoided many of the defects of those in common use, and embraced several new advantages. It is at this day much esteemed in the northern counties of England, and particularly in the West Riding of Yorkshire; and in fact appears to have been the model of that plough which has found its way into this Province. It is, however, distinguished from ours in the shape of its coulter, which is bent forward and rounded at the point somewhat like a Turkish scimitar, and is supposed on that account to be better fitted for cutting the earth, and throwing out all roots and stones in its progress. It is covered, at least that part of it which is under ground in tilling, with plates of iron, has a spiked share, is capable of being drawn by two horses, and is of easy execution. For all common purposes, it is an effective and useful machine, and is only exceptionable on account of the length of its head, and the form of its mould-board, both of which offer no small resistance.

There is, perhaps, no other instrument so well calculated for fine arable land, free of natural obstructions, as the *Chain Plough*—such as was invented and made by Mr. Small, in Blackadder Mount, Berwickshire, about fifty years ago. It received its name from the Chain, upon which the stress of draught fell whenever it met with any uncommon obstacle, and thus the size and weight of its beam could admit of material reduction. This was, however, among the least of its preeminent merits. By attaching a feather to the sock of such projection as to cut the bottom of the furrow the whole width, by contracting both the length and breadth of the sole, and by giving to the mould-board a waving line, it lessened the friction, and improved much the execution of the work. On all open and light soils, it will perform easily with two horses upwards of an acre a day, and form a more evenly and regular furrow. *Before its introduction, a pair of horses and two oxen were considered as indispensable to the drawing of the one in common use; and often four or six oxen were employed, invariably with a driver. The expense of cultivation was thus overloaded by a useless burden; for experience has shown that a couple of horses or of oxen are adequate to the tillage of all ordinary soils. Small's plough has triumphed over every opposition, and has been adopted in most counties of England, Wales and Ireland, and universally in the arable districts of Scotland. At first, it was composed of wood and iron, and weighed not altogether above 76 pounds; but latterly it has been constructed solely of iron, and has a firmer and more durable appearance. A recent alteration has been made on the mould-board by hanging it on a hinge, and thus either widening or

*Appendix to the General Report of Scotland, cap. 5, No. 2.

contracting it at pleasure: but this is imagined to impair its strength, and has not been generally adopted. In some cases, too, an iron stay has been affixed to the coulter, then passed forward through the beam, and there secured by a nut and screw. This expedient to strengthen the coulter has been introduced since I left the old country, and I only know of it by having seen, about six years ago, two of them with this alteration, on board of an Aberdeen brig, in the harbour of Halifax.

There is a species of plough used by some agriculturists in England—called the *Miner*—which is contrived to deepen the furrow and stir the earth without throwing it up on the top of the ridge; and which can only be employed in the track of another. This insrtument owes its utility entirely to the belief that the vegetable roots strike into the ground as deep as it is loosened, and that it is beneficial to extend the pasture on which they feed, farther than can be effected by the common ploughs. It is without a mould-board; because it is not intended that the subsoil should be brought to the surface, but only pierced and disturbed with a view to overcome its hardness and cohesion. There are several objections to the usefulness of the *Miner* which must weigh with every man who reasons and judges on principles. It cannot be so advantageous to stir the earth merely at the bottom of the furrow, as to throw it up by a mould-board and mix it with the soil; because in the latter case, the next slice that is cut off by the returning share falls to a greater depth, and as it contains the fibrous roots of grasses, and must be partly enriched by former manuring, the staple of the land is deepened, and the succeeding crop can both stretch its feeders to a greater distance, and extract a more copious aliment. The purposes therefore, of this instrument can be better supplied either by a strong plough which will turn up at once a ten or eleven inch furrow; or by two of common construction following each other—the one skimming the surface and casting it down—the other coming behind and tearing up the fresh and virgin earth.

There was a plough some years ago invented by the Rev. Mr. Campbell, which obtained the name of the *Argyleshire Plough* and was honoured by the Highland Society's medal. In this the coulter is dispensed with, and in place of it, the share is armed with an upright feather sloping backward, which parts the furrow-slice, and delivers it over to the earth-board. At its first appearance this was considered an excellent hoeing machine: because the eye of the holder could direct the share close to the edge of the turnip rows, and kill every weed that grew in the intervals; and besides this, none of the mould could fall over on the green crop, as it sometimes does in common ploughs, between the coulter and the sheath. In all ordinary work, too, it was found to be of easy draught, and of admirable execution; and it possessed the peculiar advantage of never being choked from the accumulation of stubble. Notwithstanding all these recommendations, it never came into very general request, because its principal usefulness—that of hoeing green crops—was almost instantly superseded by the introduction of the *Skim Weeding Plough*, which has become a highly

effective instrument in the drill husbandry, and is decidedly superior for destroying all weeds between the rows.

As this is an instrument that belongs to the drill husbandry, and is of paramount importance, I shall be a little more particular in the description, that my readers may be able to form a just idea of it, as they cannot have the benefit of ocular inspection; for at this moment there is not one in the Province. As might be expected, it has been constructed with considerable diversity in the arrangement of the parts; and the ingenuity of mankind has been active in both simplifying and improving these. The most common form of the weeding plough consists of two handles, which are of equal size and strength, and which extend forward to the very point of the sock. There they meet in a common joint on which they turn; and they can be placed at a lesser or greater distance, according to the width of the drills. Immediately below this joint is fitted a triangular sock, which sinks a little in the ground and cuts up all annuals in the centre of the intermediate space. Behind this sock, and in the handles, are inserted *tines* like the teeth of the brake-harrow, which stir, when the plough is in motion, all the earth that lies beyond the range of the sock; and further back in each handle, is fitted a share with an upright feather somewhat similar to that of the Argyleshire plough, which moves close to the rows, and turns in the earth from them towards the centre of the drill. This machine, by the peculiar construction of its parts, performs in one operation what the common plough accomplishes in two—it turns the earth from the rows, and accumulates it into a rounded heap in the middle of the interval. This it effects by the angular position of its two shares, the heels of which scoop in the mould, and the whole intermediate space is well hoed and stirred by the action of its sock and harrow teeth. With this instrument a man and one horse will execute a great deal of work, and that too with much effect; and it is a decisive and unquestionable improvement in the modern system of Agriculture.

After this implement has gathered up the earth in the centre, and effectually buried and destroyed all weeds, the *Double Mould Board Plough* is requisite to cleave this ridge, and spread the earth back towards the roots of the plant. This plough is so well known as to need no particular description. Suffice it to state, that its mould-boards should be moveable on hinges, in order to expand and narrow them at pleasure. This is essential for adjusting them to the exact width of the drills, and it fits the instrument to be used in all sorts of green crops which are planted in rows of equal distance.

Of late the various parts of these two ploughs have been combined and modelled into one; which has proved, in the first instance, a great diminution of expense, and has on trial been acknowledged equally advantageous and effective. By a slight change in the machinery it can be speedily prepared either for weeding the rows, or earthing up the plants; and this excellence has given it a superiority over the other two, which have been, in a great measure, supplanted. Its

general form bears a close resemblance to that of the common plough, as it has a beam and muzzle—a head, sock and in some cases, a coulter,—the two handles fixed into the head and beam,—with other parts of analogous structure. The sock, however, is furnished with two feathers, and is of a triangular shape; the mould-boards are moveable for greater or less expansion, and can also be entirely separated from the body of the instrument when it is to be used as a weeding plough —in which latter case two wings, armed with straight and curved coulters, are secured to the beam; and these also, by means of hinges, can be spread out or contracted, to correspond with the width of the intervals.

I surely need not dwell on the undisputed advantage to be derived from this plough, and I shall only add, that it should be of light construction, and well proportioned in the adaptation of its parts. It is always wrought with one horse, and is admitted not only into the field, but sometimes into the kitchen garden, to earth up turnips, cabbages, and potatoes.

Besides these different kinds of Swing Ploughs which I have just now delineated, there are a numerous class built with wheels, which have many advocates, and are of extensive use in England. These latter are all distinguished by one common circumstance—that of having one or two wheels fitted towards the point of the beam, to regulate the movement. This apparatus of cumbrous machinery was at first attached solely to supply the inexpertness of the workmen, and has been continued from that unyielding stubbornness of national manners, which often resists improvement because it comes in the "questionable shape" of innovation.

The introduction of these into this Province, considering that they occasion greater friction, cost more expense, and are much more liable to be injured and put out of order, would be a serious bar to the advancement of our Agriculture; and I do not hesitate a moment to condemn them as totally unsuitable to our present condition. Besides, they have no superiority in the arrangement of the more important parts, and their coulters, socks, sheaths, and mould-boards differ not from those of the swing plough, and for these reasons, they prefer no title to universal adoption. I leave them, therefore, entirely out of the question; and in my next letter I shall point out the ploughs which I deem of indispensable utility, and assign my reasons for supposing *such* necessary to promote our Agricultural success.

Halifax, Nov. 12, 1818.

TO CORRESPONDENTS.

This week has produced several letters, which require no particular reply. I must here publicly enter my caveat against all direct and indirect inquiries about myself; and I call on my correspondents to reflect on the consequences of a premature discovery. I surely have a

right to muffle myself in a cloak of invisibility when I am only dispensing favours: and it will be time for prying curiosity to tear it off when I act unworthy of my assumed character. My PRIVATE letters to an individual near Annapolis are, I hear, undergoing a very rigid scrutiny, and the hand-writing dissected, to drag me from my privacy; but let him and others know that they thus betray my confidence, and defeat my very usefulness by such improper surmises. The moment Agricola is detected, from that moment he ceases to have the same ascendant. He wants neither profit nor distinction by these letters, and surely when he is devoting his time and incurring much expense for the benefit of the public, he may be allowed to obey that injunction of religion which prescribes that in good deeds "the left hand should not know what the right hand does."

ADVERTISEMENT.

If there be a copy of JETHRO TULL'S Horse-hoeing Husbandry in the Province, Agricola suggests that it be sent him for perusal. He has not read it for the last 14 years, and although he recollects the general system, he has forgotten the details and illustrations.

No. 18.

ON THE PLOUGH.

THE condition of the agricultural classes in this Province is so dissimilar in point of wealth and local advantages, that the same sort of machinery cannot be safely or prudently recommended to all, without distinction. The new settler, struggling with a thousand difficulties, shivering in his log-built hovel, scarcely enjoying the necessaries of life, and hemmed in not infrequently by a pathless and gloomy forest, cannot be supposed to have the means of purchasing the ploughs essential to the tillage of the cleared and arable districts. Neither, in realty, has he any occasion for them. The ground is too firmly occupied by the stumps --these mutilated remnants of the wood— to be easily subjected to that improved mode of cultivation, which is incompatible with numerous or very material obstructions existing in the soil. He must wait till time effects those meliorations, which cannot be brought about speedily without an infinite waste of labour and expense. The common plough is all that he should aim at; and indeed, all that is within his reach.

I would not even hazard to commend any other instrument to the countryman who has just got a little above the lot of the former, and has only perhaps, from ten to thirty acres of cleared land. One plough is perfectly sufficient for all his necessities ; and where one only is wanting, it is best to abide by that to which habit and custom have inured him. The state of the Province, in many places, presents insuperable bars to the introduction of the new husbandry ; and centuries must elapse before the yellow harvest can wave upon those uplands now under the dominion of the forest. But although we are thus excluded by physical circumstances from attempting a better mode generally, particular counties are ripe for improvement, and they should take the lead, and set the first animating example. Several parts of the county of Sydney—many of the district of Pictou, and of Colchester—nearly the whole of Cumberland and Hants; of Horton, Cornwallis, and of Annapolis—with detached spots in Queens County, in that of Shelburne and Lunenburg, and also in the district of Halifax, have attained that maturity of cultivation which is favourable for the trial of the new and improved machinery ; and I invoke the opulent and patriotic to hearken to the sacred call of their country, to fling aside stubborn and benumbing prejudices, to break through the restraints of old and established habits, to enter with becoming fortitude the field of experiment, and deliver us by their cheering and vigorous co-operation from this slavish dependence on foreign bread. Our Agriculture ought now to be raised from its postrate and fallen state; our grass lands to be converted into tillage ; the drill system to be introduced ; and capital from other sources attracted to the soil. I hail the rising spirit of improvement, which has already partly shed its

vivifying influences, and "dovelike sits incumbent" over the rude and indigested mass of our rural chaos—which is beginning to quicken, arrange, and illuminate—and which ere long, if cherished by wise and liberal provisions, will exalt this Province, in her agricultural concerns, to an enviable pinnacle of independence and plenty. When we can draw the means of subsistence from our own soil, population will multiply apace; the price of labour will assume its relative level; our fisheries will be invigorated, because we can feed our fishermen; and domestic manufactures, which always come last in the train of national prosperity, will erect the loom, the forge and the wheel, and swell our other resources by their enriching treasures. The very first step in this progress is the improvement of our husbandry: and this has always been accompanied with improvements in machinery.

Though no enemy to the Yorkshire Plough in common use, yet I cannot help giving a decided preference to SMALL'S PLOUGH, as improved and perfected by the unwearied mechanic genius of the inventor. This, in several districts of Scotland, continues to be built, in the head, beam and handles, of wood; for which it has advocates among farmers of great skill and experience; while in others it is composed solely of iron, and is reckoned, when so constructed, the best and most forcible instrument that can enter the soil. From being made of this useful metal, the size and proportion of all its parts can be so reduced as to occasion the smallest possible friction; and its very wear polishes and brightens it for use. If kept under cover, it will last for many years; is little liable to be put out of order, and is easily repaired. Its first cost, although somewhat higher than the wooden plough of the same make, is abundantly counterbalanced by its strength, durability and effectiveness; and it is evidently worthy of a trial on our marshes, intervals and cleared uplands. Some are of opinion that the chain, which of late years has been attached to the IMPROVED SCOTCH PLOUGH, as Small's is generally called, is far from being a valuable addition—on this account, that in case of meeting with any sudden and abrupt resistance, the shock is too violent, as the chain yields not, like the beam, with an elastic spring; and accordingly, it is now generally omitted in the construction. But this part, although of such importance as to give the instrument its name, may be dispensed with and thrown aside, without abating from its other good qualities. Its superiority is founded on the feathered shape of the sock, on the curved and sweeping flexure of the mould-board, on the diminished size of the sole and of the land side, and on the form and adjustment of the muzzle, by which the line of draught is regulated,—and to all these Mr. Small can justly lay the claim of invention.

Every cultivator, who has marsh, interval, or even cleared upland to any extent, should furnish himself with this instrument, and in a short time our country workmen will become sufficiently skilful to fabricate it either of wood or iron. There is hardly a smith in the agricultural districts of the parent state, who deems himself incompetent to the task; and although some of them attain a more distinguished

eminence in this line, all of them are capable of framing and putting it together, to be tolerably effective. We have already in the Province a sufficient number to serve as models; but it would be advisable to import a few more; and they can be obtained equally from Leith, Greenock, and Aberdeen.

If Small's plough be of such essential service to the furtherance of our Agriculture, the drill machinery will be more so, and that in an infinite degree. I admit, and it is a sort of objection against introducing it into the Province, that the weeding plough requires previous dexterity in drawing straight furrows, and perseverance in removing from the soil stones, roots and other obstacles, as indispensably necessary. At the same time, this implement in the hands of an expert ploughman will most effectually destroy all weeds between the rows of green crops, with ten times less labour than the hand hoe, and with half of the common plough. Its triangular sock penetrates the centre of the interval, cuts and severs the roots of annuals, and its teeth and shares stir the earth, and impart all the benefits of the horse-hoeing husbandry.

Since I commenced this series of letters, I had the mortification to see this with its accompaniment—the double mould-board plough—on board a British vessel in this port, brought from the old country, not to forward and revive our Agriculture, but addressed to a gentleman in Boston. I could not refrain breaking out into an apostrophe on the occasion, and bewailing the lukewarmness of this ill-fated colony, which could allow instruments of such manifest utility, to pass quietly and unnoticed to our rivals, there to rear that flour which we were afterwards to pay. The talents and ingenuity of England were pressed into the service of American agriculture; and the inactivity and ignorance of Nova Scotia were to find for it a market. Let the blush of shame kindle its lurid fires in every cheek, and burn there unextinguishably till we wash out this foul blot by an universal excitation of public enterprise. The day is past to talk any more of the inferiority of our climate or the barrenness of our soil. This fine-spun cobweb, in which the spirit of improvement was entangled—where it struggled, spent its force, and expired—is irretrievably brushed away; and we are awakened from the torpor in which our energies were palsied. It is a profanation of the gifts of Heaven to indulge such unhallowed thoughts: for if there be a country adapted to the culture of corn, and to the production of green crops, that country is Nova Scotia. Its Spring, though late, is vigorous; its Summer glows with a teeming and prolific warmth; its Autumn is mild and long to an extreme; and taken all in all, it is more than amply sufficient to ripen all sorts of grain. What, then, do we want? Not the blessing of kindly and genial seasons, but the skill and well-directed labour of man.

That skill and that labour, aided and enlightened by the use of the WEEDING and DOUBLE MOULDED PLOUGHS, would bring in a new and eventful epoch, and prepare for the extension of green crops, in the management of which they cannot be dispensed with unless by

making great sacrifices. The first gathers the earth into the middle of the intervals, and the second divides and spreads it back towards the roots. These two are all that are required, in the mean time, for the horse-hoeing culture ; and their joint cost at home varies from eight to nine pounds sterling, according to the strength of the materials and the execution of the workmanship.

The agricultural societies, which are now established, and to which the country has a right to look up for encouragement and direction, should each of them set the example of importing next Spring two sets of these implements ; and this plan may also be adopted by such wealthy farmers as feel the inspiring influence of public spirit. The very handling of these tools, independent of all views of their excellence, will operate with great force in stimulating and forwarding our Agriculture ; and I shall dedicate the remainder of this letter to state a few of their more palpable advantages.

I. They will compel the cultivator to draw his furrows in straight lines, and to deepen his ploughing. These two circumstances lie more at the bottom of good husbandry than we are apt to imagine. Some are foolishly of opinion that if they apply to land a good dressing of dung, they have done all for vegetation that art can effect. No theory can be more false or more pernicious. The soil that is properly opened by tillage, and frequently stirred by subsequent hoeing, will yield more luxuriantly than that which, though rich in manure, is carelessly and imperfectly wrought. As much depends upon the operations of the plough as on the contents of the farm yard ; and this belief has had a mighty influence in the unprecedented and gigantic strides which the art, during the last half century, has taken in Europe. Correct ploughing is the first and great lesson taught to, and impressed upon, the farmer ; and this consists in drawing a straight furrow, and at a regular depth. When this is accomplished in the first instance, all the after operations go on with more exactness and facility ; and in truth without this, the weeding plough commits dreadful havoc, and is utterly destructive. When the lines in which potatoes, cabbages, and turnips grow, are not straight and equidistant, this machine, which from its moveable joint, is widened to embrace the whole interval, must either encroach on, and interfere with, the crop, or must frequently be stopped and, by the workman, adjusted to occurring irregularities. This inconvenience attending its use, compels the farmer to pay attention to his ploughing, and to rectify the defects which naturally creep in under slovenly management. It becomes, as it were, the corrector of the previous work, and by it the master can tell when it has been accurately and systematically executed. Like the plummet of the stonemason, which determines the perpendicularity of the wall, the weeding machine detects every deviation, and points out with most infallible certainty the best and most expert ploughmen.

The usefulness of the double moulded plough is no less apparent. In cleaving asunder the ridge in the middle of the interval, it overwhelms all weeds, supplies fresh earth to the roots, and lays it up so

loosely that they can extend themselves freely, and in all directions. By the same operation being performed a second and a third time, it accumulates the bulk and height of the rows, and supplies the crop with additional nutriment. Besides, every successive earthing up deepens the furrow in the centre of the interval, and brings up the subsoil to be mixed with the surface mould. By this means the staple of the land is increased; a deeper, softer and richer bed is prepared for the succeeding grain; the whole soil is mellowed by these reiterated hoeings; weeds of every kind are extirpated; and the future fertility, in place of being exhausted and impaired, is preserved and augmented. It must be plain, however, that before all these advantages can be reaped, we must train our farmers to be just and exact ploughmen, and therefore, the *Pictou Society deserves well of the community, in having assigned the first premiums for such exhibitions. It is to be hoped they will soon be followed by others in this, their meritorious example, that we may gradually pave the way for the drill system.

II. The introduction of these two instruments will not only tend to deepen and pulverize the soil, but will multiply exceedingly the quantum of agricultural produce. My readers, I am afraid, will be startled at the facts which I will adduce in attestation of this doctrine; and would call in question the credibility of my testimony, could I not appeal to unexceptional evidence. This is by far the most important view, in which the drill husbandry can be placed, and I regret that my limits restrain me from giving it a full and ample discussion; but I shall recur to it in some after part of my course. Suffice it, in the meantime, to state, that as all plants are sustained by their roots, the quantity of food with which they are nourished must be proportioned to their range and extension. The further they can diverge, the greater and more luxuriant the growth; and hence the frequent stirring of the soil by means of the horse-hoe machinery loosens the bed in which they ramble, and lessens the resistance they would otherwise meet with from the subsidence and consolidation of the ground. It is for this reason, that a garden is always more productive than a field; because, in the first place, the deep digging and breaking of all clods by the spade, and the frequent hand hoeing afterwards, enable the roots there to stretch to a greater distance; and indeed the first conception of the horse-hoe was borrowed from the obvious and acknowledged benefits of the same operations on culinary vegetables. When this system, therefore, overstepped the walls of the garden, and began to work in the field, we might expect, a priori, similar and concomitant effects; which must be ascribed, not to the efficacy of dung, so much as to the pulverization of the soil. It seemingly outrages all probability to mention the quantity per acre, which can be raised in green crops by means of the machinery which I am now recommending;

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*A short time before the date of this letter, the Pictou Society held the first Ploughing Match ever witnessed in Nova Scotia; and this took place in a field belonging to their President —Edward Mortimer, Esq.—and under his directions.

and therefore, I shall not state it in loose and general terms, but at once bring forward my evidence in an authenticated shape.

The Androssan Farmer *Society, in 1814, offered a silver medal for the best and heaviest crop of turnips in the parish of Dundonald, situated in the West of Scotland, and appointed two judges to inspect the different fields cultivated within the bounds. They proceeded in the execution of their duty and in compliance with the requisition of the society, by weighing a square fall, or rod as it is here called, taken from the average of the fields at two different parts, and the result of their investigation was as follows :

In the Fullarton Farm, belonging to His Grace the Duke of Portland, under the management of Mr. Woods, they found that a Scotch acre,—which is a little more than an acre and a quarter, English measure—produced in turnips—

	tons.	cwt.	lbs.
Of bulbs without the leaves, -	76	0	0
Of leaves by themselves, - -	14	0	0
Total, -	90	0	0

Forty bushels of turnips are about equal to a ton, and the quantity per acre, therefore, in bulbs alone, rise to the enormous amount of 3040 bushels, besides 14 tons of leaves of highly nutritive quality. Estimating the bulbs at 2s. per bushel—their value in this market—an acre will fetch £304 currency—a sum sufficient to awaken the utmost agricultural industry.

On the glebe of Rev. James Muir—			
The bulbs weighed, - - -	49	11	17
The leaves, - - - -	17	5	51
Total, -	66	16	68
At Stonecastle, belonging to William Taylor, Esq.—			
The bulbs weighed, - - -	48	7	16
The leaves, - - - - -	20	0	0
Total, -	68	7	16
The same proprietor had yellow turnips, of which—			
The bulbs weighed, - - -	31	5	80
The leaves, - - - - -	10	5	80
Total, -	41	11	48

The prize was allotted to the Duke of Portland, and there was nothing singular stated as to the mode of cultivation. These quantities although extraordinary, must not be supposed to be unprecedented; for throughout all Scotland and England, crops of similar bulk and

*Farmer's Magazine, vol. 16, page 157.

weight could be selected in every parish and county. From these details I shall but make one observation—pregnant however with instructive inference.

The turnip crop, according to the modern system of rotation, recurs on suitable soils once in every four or five years; and during the interval, there are three or four other crops of grain and clover taken from the same ground. Let the quantity of all these be summed up, and the gross produce will be great beyond conception, and easily explain to us, how the British farmer, with less prices for his agricultural produce than ours receive, can afford to pay from two to five pounds of annual rent per acre. Turn now to our mode of culture: suppose the same lands lying under grass for five years, and estimate the weight and value of the hay which can be carried off during the whole period. It is more than the average produce of our best uplands to calculate it at two tons per acre, and on many it does not exceed the fourth of that quantity. The hay, therefore, fit for feeding cattle, which could be gathered from such soils, at the highest computation would not exceed in five years ten tons altogether—the value of which at the place of growth, speaking generally, will fluctuate between £15 and £20. Whereas in Great Britain the same ground in one year will raise from sixty to ninety tons of turnips, and in the other four, one hay and two grain crops, besides a year of pasturage. The drill and turnip husbandry thus enables land to furnish abundance of subsidence for a great population; and also to maintain a larger stock of cattle, than when it is suffered to remain constantly in grass, without the benefit of regular and periodical tillage.

III. The introduction of this machinery will necessarily and naturally lead to the modern system of culture, which will open the most flattering and enlivening prospects. The great line of demarcation between the present and old courses of cropping consists in the invariable alternation of green and white crops. The best cultivators never take from the same field two corn crops in succession, but interpose between them either beans, carrots, or other green vegetables; or when the soil is a stubborn tenacious clay, and unsuited to the production of turnips, they have recourse to a Summer fallow, recurring at as distant an interval as is compatible with the cleanness of the land. White crops are experienced to have an impoverishing, and green an enriching effect; and therefore the due and regular interchange of these preserves a sort of perpetual fertility, and affords every other year an opportunity of extirpating all weeds, and of subdividing and loosening the soil. This is not the whole of the advantages resulting from this system. The consumption of green crops by cattle either on the ground, or when carried into the barn, creates vast quantities of the richest manure, which is again employed in replenishing the soil for the raising of wheat and other grain. When no other maintenance for live stock, but coarse hay and straw, is provided for Winter, it is scarcely possible to do more than keep sheep and cattle from starving; and the butcher's market from December till June

must be poorly and ill supplied. The general introduction of turnips and clover, with the regular intervention of white crops, would provide abundant food for Winter, would enable us to improve our breeds from the generous food thus placed within our reach, and would furnish a permanent and constant supply throughout the year: while to this may be added an astonishing increase of bread, more than amply sufficient for the wants of the Province.

With such hopes and prospects I am entitled to claim some little exertion on the part of the agricultural societies, and of patriotic individuals, for importing and bringing into use the horse-hoe machinery, which would in three years entirely change the face of our affairs, would more than quadruple the productiveness of our soil, would beget an universal spirit of bold and fearless enterprise, and usher in that auspicious day, when we shall be emancipated from the thraldom of American dependence. I have not done half justice to this important subject in these brief and ill-assorted observations, but I shall review it afterwards, and place it in its more commanding and imposing attitudes.

Halifax, November 18, 1818.

TO CORRESPONDENTS.

I have this week a letter from King's County, with only the initials of the writer's name, furnishing me with the first volume of the proceedings and publications of the Halifax Agricultural Society, which was founded in 1786, languished about three years, and died a natural death; because it was placed on no permanent footing by the Legislature. Every establishment which aims at the improvement of a country, and which promotes not the individual emolument of the men who compose it, speedily falls to pieces, unless it be cherished, privileged and endowed by the government; and this effect is so infallibly certain from the known operation of self interest, that all enlightened States have taken care to provide for such institutions either by an adequate grant of money at first, or by an annual appropriation. When men contribute their time and labour to the business of such societies, they are apt to imagine that their duty is fully discharged; and unless the Legislature interest itself and draw on the general purse to meet the contingent expenses, patriotism gradually cools, and selfishness assumes her wonted ascendancy. The writer promises to place at my disposal some practical knowledge he has acquired respecting the clearing of land; and when he does so, I beg the favour of his name, that I may return him the volume, having borrowed another of the same kind from a correspondent in a very early part of my course.

I have also received a letter from Annapolis, containing some observations at variance with my views relative to the agricultural capabilities of the Province, and promising me afterwards a fuller communication. I solicit the correspondence of those who differ from me

in opinion, for I am not vain enough to imagine that in traversing such a field of enquiry I may not be betrayed often into error. Truth is only elicited by the collision of sentiment. He also gives me reason to hope that ere long he shall be able to acquaint me with the formation of an agricultural society at Annapolis. This last week, too, I have heard that a few leading characters at Lunenburg are bestirring themselves to found one there—a place highly suitable, as being surrounded with a well-cultivated district.

Unless my labours shall terminate in the general formation of agricultural societies throughout the country and in the establishment of a Central Board in Halifax, under the sanction of the Legislature, as the organ of the rest, my writings and anxieties shall have been literally thrown away. A judicious and spirited culture can only be introduced and permanently sustained by the union and association of men in societies constituted for the special purpose of stimulating industry and advancing improvement. Like the crowing of the cock to Peter, I may alarm the farming classes, may awaken them to a sense of their errors, and set a new train of ideas into motion; but they themselves must repent and reform.

Halifax, November 19, 1818.

No. 19.

ON THE HARROW AND THE ROLLER.

THE only effect of ploughs in subdividing the soil, is to cut it lengthwise into furrows varying from six to ten inches, according to the pleasure of the workman. They are contrived, not so much to produce pulverization, as to reverse the surface, to overwhelm the weeds and the remains of the pre-existing crops, and turn up a fresh mould for the reception of the seed. A field of strong clay, after it is laid up into regular ridges by the action of the share and the mould board, is almost as little subdued in its tenacity as before the operation. It has only been pierced one way, and ranged into unbroken and unpulverized strips, placed alongside of each other. The former roots maintain firm possession, the earth is little stirred or shaken from them, and without the aid of some other implement the work is ineffectual and incomplete. Hence the harrow is of as ancient date as the plough, and of as prime necessity. The one inverts the glebe, and the other reduces it to powder: the one buries the weeds, and the other tears out their roots; the one brings up the fresh mould, and the other breaks the clods and overcomes their cohesion. According to the diversity of soils, and the particular uses to which the harrow is to be applied, its form undergoes considerable changes; and we cannot understand the principle of these, without taking the other circumstances into account, and instituting a comparison between the ends and the fitness of the means.

In all stiff soils, which are apt to harden and cake into a solid body, and are besides infested with weeds, the BRAKE HARROW is unquestionably of pre-eminent utility. From its bulk and weight it will make a deep impression, when an ordinary instrument merely scratches and floats on the surface. It consists of four square bulls, each 6 1-2 feet in length. The teeth are 17 inches long, bending forward like a coulter, and five are inserted into each bull, fixed above with a screw nut, and standing out below twelve inches free, with a heel to each projecting behind, and resting on the under part of the wood, to enable it to resist the impediments which it may encounter in its progress. The nut above is necessary to facilitate the taking out of the teeth for sharping and making other repairs. The brake, when complete, is of a square form, is yoked at one of the angles, and has an iron bar stretching across in the line of the draught From the description I have given it must be apparent, that no instrument could be better fitted to loosen and pulverize the soil. Its long tines reach to a great depth, and their shape enables them to part the opposing clods, and to tear out the noxious roots which bind them together. It will be found of infinite benefit to our diked marshes so soon as we begin to fallow them—an operation, which is the very first step towards their judicious culture, and which cannot be deferred much longer, if we

wish to become enlightened agriculturists. From their strength and adhesion, these lands, although confessedly the richest, are ill calculated for the production either of potatoes or turnips, both of which delight in an open and dry soil, and there only thrive to repay the labour of cultivation. From this incapacity of our marshes to yield the only green crops, used here as a fallow, they have been placed under a course of management, irreconcilable to all the known principles of good husbandry, and for that reason, they have not hitherto put forth the half of their fertility. They are literally overgrown with weeds, which nestle in the soil to the manifest disadvantage and starvation of the crop: and no vigorous means are taken to extirpate this host of enemies. All that is attempted is of a palliative nature, rather to check their incursions, than entirely to destroy them: and the productiveness of these fine lands is wasted and thrown away by being kept for ten or twelve years under grass, and only opened at very distant intervals to admit of two scourging crops of wheat in succession—a system so wretched and reprehensible, as not merely to merit reproof, but to engross all our execretion. It should ever be remembered, that four acres of the best grass consumed by cattle can scarcely raise as much human food, as is produced by one acre of good corn land; and that wherever the soil is suitable for the plough, it is a most unprofitable application, chiefly to appropriate it for hay and pastures

Clay soils of similar description in the mother country, which like these are of alluvial origin, and have been reclaimed from the ocean, are subjected to what is called the seven years' rotation, which I shall succinctly narrate for the benefit of my readers. I shall not be incautious enough to assert, that this mode should be embraced all at once by the owners of our diked lands; but certain I am, that were these situated within the precincts of the British Empire, and brought within the powerful sphere of her skill and capital, they would not be suffered to remain as ARTIFICIAL MEADOWS, but would be forced to contribute largely towards the supply of her corn market. All such level and rich situations are thickly studded with farm houses, laid out into moderate and regular enclosures; and instead of wearing throughout the year the same unchanging livery of green, they glow with every varied tint, from the brown and dull colour of the earth, to the yellow glories of the harvest. Their surface presents a chequered scene, delightful to the beholder, because indicative of plenty. There the blossomed bean sheds its fragrance, and scents the breeze: in one place you descry the cow reclining under the shade, and ruminating at leisure; in another the horse sweating in harness, and turning the fallow glebe; here a leguminous crop in flower is visited and rifled of its sweets by the neighbouring hives, and by its side is growing barley or oats rustling in the winds; the clovers refresh the sight by their dark green, and the wheats by their bending and loaded ears; all is bustle and activity; nature lavishes her riches, and man seems grateful for the gift. Such is the picture to which my boyish days were accustomed: and my fancy, fired by these early recollections, has crowded into the

canvas all these familiar images, and impressed my language with a sort of poetical inspiration inconsistent, I fear, with the soberness of these letters. What a contrast is the Grand Prairie in Horton, rich as it is in verdure, but exhibiting a dull and monotonous uniformity, to such a living and animated landscape. When I saw it, the fertile and cultivated marshes of England rushed into the back ground, and rose before me in all their rich variety. After the lands are enclosed, chiefly by a wide open ditch, surmounted sometimes, but not always, with a quick set hedge, they allot their fields to different parts of the rotation, and proceed in the following order: (1) A naked Summer fallow, in which the ground is ploughed five or six times; (2) Wheat, chiefly sown in autumn, from September till the work is interrupted by the frost; (3) Beans, sometimes in drills which are horse hoe'd, but often beans and peas growing promiscuously in broadcast; (4) Barley sown with grass seeds—chiefly clover and ryegrass; (5) Hay, taking from the ground only one cutting, and depasturing the after growth; (6) Pasture, unless where soiling has been introduced; and (7) Oats: and after these the same is recommenced. According to this plan two white crops never succeed each other, but either a fallow, pulse, or grass invariably intervenes. If a farmer rents 70 acres of marsh, he divides them into seven lots of ten acres each: and each lot in succession comes to be cropped conformably to the above rotation. It must not be, however, supposed, that he throws his whole farm at once into fallow, because this would deprive him for one season of every kind of crop. He only subjects to this operation one enclosure of ten acres, and cultivates the rest according to the best of his judgment, and his command of manure. The second year he summer-fallows another enclosure of 10 acres, the last being now under wheat, and thus he proceeds annually, till he brings all his land under this system, and so upholds it till the expiry of his lease.

We have no further connection at present with this method of cropping, than as respects the first stage of the process, and the subserviency of the Brake Harrow during the fallow, in the extirpation of weeds and the pulverization of the soil. Between the ploughings, this instrument is attended with vast advantage, if dragged across the furrows, both by breaking them into small pieces, and separating from them all the tangled roots. Every clod will be subdued and crumbled into fine dust; the whole soil will be loosened to the foundation; stones and other obstacles will be brought to the surface, and the future crop will have free access to extend its fibres to the utmost limit of their range.

This implement, although principally useful in strong stiff soils, will be found a great auxiliary in much of our intervals and uplands. These, we all know, are upon the whole, of a looser texture than our marshes: nevertheless the Brake Harrow will be of considerable avail in preparing them for turnips, which of all green crops succeed best on light soils. The sacrifice of a year's crop on such is neither called for by necessity, nor sanctioned by the best practice of modern agricul-

turists. It has been confirmed by the experience of half a century, that a naked fallow on free soils may be dispensed with ; and that its place is as effectually and more profitably supplied by potatoes, carrots, turnips, or other drill crops, which admit of frequent hoeings by means of the weeding and double moulded ploughs, and which can be prepared beforehand by the combined action of all sorts of machinery. The BRAKE, therefore, in consequence of its strength and weight, and its power to reach the bottom of the furrow, is an implement of great utility, and may be safely recommended to the farming interest.

But harrows of a lighter make are no less necessary for other uses, and particularly for covering the seed which is sown broadcast. Of these there is such a vast variety, that it is extremely difficult to make a selection, which will be specially adapted to the wants of our husbandry. There are three kinds which may be noticed, as they all possess very considerable merit, and have, in England, met with a pretty favourable reception.

The common DOUBLE HARROWS may be ranked first, which are composed of two distinct parts, bound together, when in operation, by connecting chains. These can be used either single or double, and are extremely serviceable in ordinary farm work. There is nothing peculiar in their form or composition, and as they are easily constructed, and not subject to be put out of order, they will always deserve a place among agricultural utensils.

Next to these may be mentioned the CRANK or CHECK HINGE HARROW. This is exactly of the same make as the last, with this difference, that in place of being united by a chain it is connected by a hinge which can bend downward, that the instrument may ply to all inequalities, but not further upward than to admit the two parts to be on a level. This check on the hinge is supposed to give a decided advantage, by increasing the weight and effectiveness ; and it certainly acts with greater force in deeply burying the seed, so that the young plants are protected from the vicissitudes of the weather.

There is a third sort called the CHAIN and SCREW HARROW, formed altogether of iron, and different in shape from the others. This is composed of two pieces, each of a triangular figure, and when conjoined by the two sides being brought together, it resembles a square. If we suppose a common harrow cut across from corner to corner, and formed into two distinct parts, we shall be able to conceive the shape and utility of this. Its line of draught corresponds with the line of section, and its two parts are at liberty to bend on the crown of the ridge and break the clods more effectually than if it were a whole and unyielding piece. Again, when it moves in the furrow, between two ridges, the chain, which lies along its back and crosses the line of section at right angles can be screwed up until its form exactly accords with the bending and declivity of the two adjacent ridges : and thus by the lengthening and shortening of its chain at pleasure, it can be accommodated to the irregularities of the surface, and operate with much more effect. In the present state of our Agriculture the first of

these, perhaps, from its simplicity is the best: although at the same time it must be acknowledged that the other two seem to possess superior claims, were a spirit of enterprise to guide our decision. But in the infancy of the art, before the minds of men have been much turned to study the contending advantages of different models, and while capital can be much more beneficially employed in actual and positive improvement, it would be wrong to diffuse a taste for much variety in farming machinery. It will be better to aim at what is within our reach than aspire to what is unattainable. Either of these kinds will most completely cover the seed that is sown broadcast, and reduce the mould to a sufficient degrees of fineness.

There are various other sorts in England which pass under different names, and are constructed on peculiar principles according to the uses for which they are designed. It would be abusing the patience of my readers to enter into a detail of these because they are totally inapplicable to our present condition, and of course possess no immediate and commanding influence.

Among these may be slightly noticed the *REVOLVING BRAKE HARROW which is a machine moveable on wheels, the axle of which is armed with long, sharp teeth in the shape of scythes that enter the ground as the machine moves forward, pierce the clods, tear out the roots of weeds, and are accounted an excellent invention for perfecting the process of a Summer fallow. A rake, as part of the instrument, follows behind the teeth, and collects into heaps the weeds and roots which are extricated from the soil.

Another of a very light make and commonly known by the designation of THE GRASS SEED HARROW may be also mentioned under this head. From the smallness, the number and the closeness of its tines, it is admirably calculated, not only for covering grass seeds, which is its principal use, but for finishing in a very perfect manner any piece of land that is meant to be wrought into a fine mould: and a set of agricultural tools on an arable farm at home would be reckoned incomplete without the addition of this one.

When we turn from the contemplation of this multiplicity of British harrows esteemed essential to the thorough reduction of the soil, and confine our view to the rudeness and paucity of our own, we must be sensible of a remarkable dissimilarity. The shapeless and awkward instrument which tumbles among the stumps in our wood lands, and scratches rather than penetrates the ground, and the wooden harrow in common use in our best cultivated districts, consisting of one piece, and constructed without any great skill in the arrangement of the teeth, are strong indications of our ignorance in all those arts, by which the latent qualities of the earth are drawn forth into luxuriant production; and are incontestible evidences that we have taken no more than the first or second step in that long career, which must be measured before we approach anything like excellence.

* This was invented by Mr. Samuel Morton, Leith Walk; and was afterwards imported by the Central Board into this Province.

There is another use of harrows, distinct from all those I have yet narrated, which was quite prevalent in the ancient husbandry, and has been sometimes practised in the modern:—I mean dragging this instrument over the growing corn, after the blade had sprung up and equalled the furrows. This was styled by the Romans SARRITION, is noticed both by Virgil and *Columella, and prescribed by them as one of the maxims of husbandry. This operation was performed, sometimes along the line of the furrows, and at others across them; and rules are laid down for the fitness and expediency of both modes according to the nature of the crop. Its principal utility with these writers seem to rest in loosening the soil, that the next process—which was that of hand-weeding—might be more easily executed, and also in supplying fresh earth to the plants that they might vegetate with renovated vigour. That both these ends would, in some measure, be gained, is undeniable; yet, after all, the havoc committed among the tender plants would more than countervail these advantages; and the practice, since the adoption of fallowing and horsehoeing, is pretty generally abandoned in the modern system of farming. The only approximation to it is the use of the GRASS SEED HARROWS, which are driven over the growing corn to open the surface mould for the clover seeds, which could not be conveniently thrown into the earth at the time of sowing the principal crop.

I pass on now to describe the Roller—an implement so decidedly beneficial that it ought to be introduced generally throughout the Province. It may be constructed of stone, of cast iron, or of wood, and may consist either of a simple cylinder or of two moving separately on the same axle. To the roller, whether single or double, a frame and shafts may be attached for the mere purpose of draught; or this frame may be surmounted by a box in which weights can be placed to regulate the pressure In this country I would recommend the last material, as cheapest and most easily obtained. Take the body of a tree six feet long, and of bulky diameter, and round it as near as possible to a perfect circle. If intended for a double roller, cut it across into two, of three feet each; but if not, surround it with three rows of fillies, one in the middle, and the other two at the ends. Line these fillies with two inch plank lengthways, and so narrow as to ply into a circle, and bind them altogether by three iron rings. The cylinder, when completed, should be in diameter three feet four inches. Above and perpendicular to the axle, a box should be fitted to the frame, capable of containing about ten cwt. of stones, by which the pressure may be increased or diminished, according to the exigency of the case. An implement of this kind would be of signal service; and it is an incontestible mark of the very low ebb of our Agriculture, that it has not come into use.

In the old country it was customary to break all the clods by wooden mallets—an expensive and operose employment—but always

*Ligneis rastris statim jacta semina obruantur. Post sationem ligneis rastris sarriendus et identidem runcandus est ager, ne alterius generis herba invalidam medicam perimat.

undertaken in preparing land for barley. The use of the Roller superseded this drudgery, and executed the work in a more masterly style. After the ground is brought to a fine tilth by the application of harrows, many small pieces escape between the teeth, dry in the sun, and acquire the consistence and hardness of stone. Into these the roots of young plants can never penetrate, and the nutriment they contain is, so to speak, hermetically sealed. The passing of the Roller dissolves all these into powder, bursts open their hidden stores, and forces them to contribute to the general fertility. This is not the only benefit attending this instrument in the preparation of barley—a grain which is always sown after the sun has attained some influence, and the dry season has set in. By its gentle and evenly pressure, the surface is smoothed and consolidated, and the moisture necessary for the germination of the seed is with much more difficulty exhaled. All the crevices are closed, and the moisture in escaping is partly retarded by the exterior surface.

In this Province it would be of vast benefit to roll the young grasses in the opening of the Spring, after the frosts are dissolved. From the intensity of our winters the ground is often frozen to a great depth, by which the earth is loosened and enlarged in its dimensions. This circumstance arises from the property of water, which swells in its volume in the act of passing from the fluid to the solid state of ice. As the soil is fully soaked with this element from the autumnal rains, and the diminished influence of the sun, the winter finds the ground sufficiently moistened, to be enlarged in its bulk by the freezing of the water with which it is saturated. When the softening breezes blow, the ice in the soil dissolves, and leaves it in an incompact and loosened state. As it subsides, all roots are laid bare, and are extremely apt to be killed both from the want of nourishment, and also from the piercing blasts to which they are exposed. It is for this reason, that winter wheat has in a great measure ceased to be cultivated here, from its liability to be thrown out in Spring, and thus subjecting the farmer to serious inconvenience, and often disappointment of a crop. Grasses are not exempt from the same hazard; and the hopes of the year are thus blasted by a cause which, in many cases, will admit of remedy, in all, of alleviation. I am not sure, but sowing the wheat seed under furrow, at least four or five inches deep, in September, in order that it may extend its roots and take a firm hold of the soil before the approach of winter, and rolling it in Spring with the box heavily loaded, would obviate the evils of our climate, and enable us to cultivate that grain according to the improved modes of England. It ought to be recollected, that even there, about sixty years ago, winter wheat was not in general cultivation, and the heaving of the soil was accounted a powerful obstacle to its success. In Scotland, too, during the same period, Spring wheat almost universally prevailed; and her northern and bleak position was thought to be incapable of any change to the better, and utterly unfriendly to autumnal semination. The zeal and industry of British farmers, combined with their skill, have

baffled all these gloomy predictions, and taught us, at once to copy the example of our sires, and not to despair in the race of improvement.

In case of failure from the remedy of Spring rolling, we might also have recourse to the Norfolk system, which, as far as wheat is concerned, may be attempted here; and indeed the practice of raising winter wheat on new lands invites us to the trial. In that country from the lightness of their soil, they never sow this grain after turnips, but follow a rotation peculiar to themselves. After the turnip crop they sow barley the second year with clover seeds; the third they cut hay, and plough down the ley, and sow their winter wheat on the matted sod. The roots of the grass bind the soil, and prevent it from heaving; which is much akin to the same effect produced by the tangled and bound surface of our new and cleared lands. I suggest these as hints rather to be put to the proof, than as conclusions which I am warranted to draw; and I request some public spirited individuals to enter on both experiments—at first on a small scale, that failure may involve no serious loss.

There are several other purposes for which the roller may be useful. When grubs have been known to infest a field of green corn, the season of their coming abroad has been watched, and the machine heavily loaded has been set in motion, by which they were crushed, and the crop saved. It has also been successfully employed in passing over young turnips attacked by the fly, and pressing to death the insects which were rioting on the seed leaves. It is, besides, an excellent preparative for mowing, by levelling all inequalities, and making a smooth surface for the sweep of the scythe.

Halifax, November 25, 1818.

TO CORRESPONDENTS.

This week has been productive of a good deal of new and important intelligence. The interest of these letters is daily gaining ground, for even in places to which their influence was supposed not to have extended, attention has been awakened, and some preparatory steps taken towards the establishment of societies. I allude here to the counties of Sydney, and Cumberland, which I blamed in my last paper for lukewarmness: as I find from my recent correspondence that both these districts will soon exhibit their attachment and zeal in the great cause of internal improvement. I am apprized by Mr. Stephen Oxley, River Philip, of date the 10th inst., that an Agricultural Society is in embyro in that quarter, as notices are issued for a meeting of the inhabitants: that limestone has been lately discovered there, specimens of which are to be sent me by first opportunity; and that he wishes a portion of FRENCH SPRING RYE to be intrusted to his management for the benefit of the district. I have another letter from a gentleman in town informing me that a friend of his writes from Sydney: "I have

obtained the consent of every person of consequence in this district to the establishment of an Agricultural Society, and we are to have a meeting for that purpose on the 20th inst." In this letter was also enclosed the long and valuable communication from Annapolis, which I cannot, consistently with my faith pledged to correspondents, publish in the mean time; but shall gladly do so when the consent of the author is signified: and indeed should be sorry were the lucubrations of that respectable and ingenious writer to be lost to the public.

I know no prospect more exhilarating to the generous and benevolent mind than these symptoms of general excitement; and I congratulate the real well-wishers of Nova Scotia on the seeming dispersion of that dense cloud which overcast our horizon, and threw a dim shade on futurity. I sincerely hope that all the counties will be organized before the meeting of the House of Assembly, and I am NOW confident that this "consummation so devoutely to be wished," will be realized in the greater part of them. It is by these societies that the country is to be saved, and the Provincial Agriculture advanced: for which reason no means should be left unattempted by the leading characters to combine the farmers and freeholders into such associations. Nothing else will invigorate our husbandry, and permanently guarantee its stability; and I shall account myself fully requited for all my pains and exertions, when a Central Board is instituted under the auspices of the Legislature, to preside over the future views, and hopes, and fortunes of this growing colony.

O diem præclarum, quando te aspiciam? Quando Agricultura, qua nulla melior ars, nihil dignius, nihil præstantius, nihil homini bono convenientius, senatusconsulto instituetur?

No. 20.

NO part of my course, I fear, has been more uninteresting to the general reader than my late letters on agricultural machinery; although to the practical farmer I reckon them important, and not a little instructive. I shall still devote this communication to the same subject, and compress within its limits the remainder of my descriptions and remarks, that I may hasten, in my next, to the fourth section of my plan, which treats of Manures.

The FAN, or as it is called by the Scotch settlers about Pictou, the FANNERS, is a machine rather of complicated contrivance, and not capable of accurate delineation by mere language, unassisted by plates to address the eye. It consists of four square fans fixed in a common axle, which is turned round by a handle, and velocity given to it by means of teeth and pinions working into each other. This rotatory motion creates a strong blast of wind which rushes out of the back part of the machine; and the grain and chaff, falling from a hopper above into this stream of air, are separated in consequence of their different specific gravities: the corn, quickly falling through the current, is emptied out of a small aperture on one side; while the chaff, from its lightness, is carried along to a considerable distance. Wherever tillage is prosecuted to any extent, this instrument is of indispensable necessity; and it is a melancholy account of our husbandry to learn, that the farmers here, with few exceptions, depend in the process of winnowing on the variable and accidental breezes which blow over the threshing floor. This mode is not only defective, but extremely inconvenient—I do not mean to imply, that with the benefit of a seasonable and gentle wind, the work in no instance can be well performed; but I affirm that in nine cases out of ten, the winnowing is incomplete; and that if our produce, full of light and damaged grains, was exhibited in a British market, and placed in contrast with samples of the same original quality which had passed through the fans of a threshing mill, the difference would be palpable, and demonstrate the inferiority of our management. This is not the only evil attending our practice. The change of the wind must be waited for, and the loss of much valuable time is the necessary consequence—without taking at all into account, the procrastinating and listless habits, generated by this dependance on causes which we cannot control. After the corn is threshed, the business of the barn may be interrupted for days from the unfavourableness of the wind, and in the meantime the farmer sleeps away existence in idle expectation. The introduction of fans would give him a much greater command of his time: would facilitate the work, and execute it in a more perfect and masterly manner. The expense of this machine is by no means considerable; and in the old country, before the late invention and general use of threshing mills, it was accounted of essential utility, and constituted a part of farm stock as much as the plough and the harrow. Indeed, without such an in-

strument the farmer could not dispose of his grain to the corn factor; and the reason we rest satisfied with a more slovenly mode is, because our grain is seldom carried to market, but either consumed on the farm by the working cattle, or manufactured in some neighbouring mill for the use of the family. The imperfection of our management, in this department of rural economy, is on that account well nigh withdrawn from observation, and we are never stimulated to any great effort by the fluctuations of a dull and brisk demand. Not so in England. There the farmer consumes only a small portion of his produce, seldom exceeding a quarter of the whole, and the other three must be prepared for the inspection of the buyer with the most scrupulous attention. The chaff as well as the lighter particles must be completely cleaned from the saleable stock; and any admixture of the seeds of weeds or other refuse would seriously deteriorate the quality, and affect the price. This attention in the first instance, is an excellent preparative for improving the flour and meal manufactured out of the grain, and begets those careful and diligent habits which gradually spread their influence over all the operations of husbandry.

Of late years, fans, as a distinct machine, have fallen into disuse, and they are now universally attached to the THRESHING MILL, and driven by the same force. This latter instrument has become, in a great measure, essential to large arable farms, and is constructed of different dimensions, according to the extent of the crops likely to be raised. A Mill worked by six horses, will cost from £150 to £200 sterling, and is supposed competent for threshing the grain which will grow, according to the modern system of rotation, on 300 acres. One of two horse power is usually erected on a farm of 50 to 70 acres, but when of less extent, the work is performed according to the old method, and the crop is threshed by the flail, and winnowed by the fan. Although many years must elapse before our Agriculture can have attained a height to justify the general erection of threshing mills; yet I hope soon in some of our arable districts, to hear of their introduction. They are a vast saving of labour, and perform the separate processes, for which they are designed, with wonderful expedition; and in this country, they would speedily repay the outlay, could we only find use for them by extending our tillage, and the cultivation of white crops. They are driven by water or wind, but generally by horses, which move in a circle under a covered roof on the outside of the barn, and drag round a wheel placed above them, nearly in the way in which the team-boat horses act on the Dartmouth Ferry. From this wheel, a horizontal shaft proceeds, enters the walls of the barn, and communicates the motion to the internal machinery. I am much in doubt, whether I can describe the apparatus in language sufficiently precise and clear to convey a distinct idea to a person never having the benefit of ocular inspection. Yet the general principle of its construction may be easily conceived. The sheaf of corn is untied and spread out, to enter the machine, by the workman appointed to feed it. Two fluted rollers, working into each other, catch the straw, and by their

joint motion turn it inward. Behind these a drum armed with beaters is turned round with the velocity of from *2500 to 3000 feet per minute, and threshes the ears from the straw as fast as it is taken in by the feeding rollers. The straw is thrown out by the machine, and women are busied in tying it into bundles, and carrying it out of the way. The grain in the mean time passes onward over a sieve, which is kept in perpetual agitation, and through which it falls along with the chaff in a promiscuous heap. It falls not, however, on the ground, but on a board prepared for the purpose, inclining gently downward, by which it is conveyed to the hopper of a fan attached to the threshing apparatus, and driven by the same power. There it is winnowed; and on the lower floor comes out the clean grain, fit for the market, while the chaff is violently tossed forward by the excited current of air. Four horses with a driver on the outside, and within, two women to clear away the straw; a feeder of the rollers, and a gatherer of the grain, have been known in the course of six hours to thresh and complete 100 bushels, which according to the old plan, would have occupied the same persons as many days.

It is by the invention of machinery, in every walk of industry, that Great Britain has gotten the start of all other nations, and left them behind at an immeasurable distance, to wonder at the rapidity of her progress without the least hope of overtaking her. Her acknowledged preeminence in manufactures rests solely on this basis; and her agriculture of late, propelled by the same powerful cause, has outstript that of France, of Italy, and of Holland, and left her no rival in the cultivation of her territorial soil. From the agricultural survey of France taken by A. Young at the commencement of the revolution, it is unquestionable, that the productiveness of that †kingdom can stand no comparison with Britain, notwithstanding the changeable and inferior climate of the latter; and that English husbandry, in the amount of capital employed, and in the perfection of machinery, is decidedly superior to that of any other European State, not excepting the Netherlands, which, in the days of Queen Elizabeth, supplied the salads, carrots and turnips eaten at the Royal table. These roots and esculent herbs, it seems, were not then within the compass of British agricultural skill, and Her Majesty was under the necessity of sending a special messenger to Flanders, when she wished for these delicate productions: and there is more than one instance on record, when she actually despatched a courier for a simple salad.

There has been lately invented by a Mr. James Smith, of Doune, a REAPING MACHINE, that has made a great deal of noise in the old country, has been tried before competent judges, and found efficient and practically useful. We are not yet prepared for such improvements, and I only mention them to rouse the daring spirit of action and enterprise, to disperse and counteract the gloomy forebodings of

* General Report of Scotland, vol. 1, page 402.

† Vol. 2, page 126. He says "The corn products of England, compared with those of France are as 28 to 18; and I am well persuaded that such a ratio is no exaggeration."

some phlegmatic tempers amongst us, and to cheer us in the onward course of a spirited and animated emulation. "We know not what we shall be;" and as the mother country has advanced her agriculture from the lowest pitch of degradation, and taken the path of glory before us, she may be safely set up as an example, and is fairly entitled from her proud elevation to abash despair, and embolden us to strive in the same splendid career. Between the Flemish salads of Elizabeth, and the Reaping Machine of Smith, there is seemingly an impassible gulph, which nothing would have dared to cross, save British energy and perseverance. Let us not then despond of NOVA SCOTIA. Although many of her features be rugged and forbidding, there is a mildness and lustre in her eye, which touch the heart, and invite to confidence in her maternal care and provision. As her children, we owe her the devotion of our zeal; and our interests are interwoven in her fertility. If her soil be pronounced incapable of sustaining her people, she loses the firmest hold of our affections, and we cannot contemplate her in any other light than that of a severe stepmother, from whose withering influence we are tempted to escape. Our first and most sacred duty is to improve her Agriculture; to secure her independence of foreign supplies; to unite heart and hand in this great national work; to import skilful and effective machinery; to turn the attention of the landed interest to investigate her internal resources, and to leave nothing unessayed which may exalt her to a prosperous and flourishing condition. After these efforts, if she still refuses to sustain us, we may then, but not till then, think of withdrawing our allegiance, and consigning her to an ill-starred destiny.

It now remains, that I close this long account of agricultural machinery by slightly glancing at the description of the Patent Sward Cutter, the Cultivator, and in a succinct and comprehensive manner, of the implements more particularly connected with the horse-hoeing husbandry. This system is distinguished by two leading principles, which preside over its operations and the construction of its complex apparatus—economy in the sowing of the seed, and the most complete pulverization of the soil by repeated hoeings during the growth of the crop. Tull was the founder of this system, and devoted his whole life to its illustration and defence. In regard to the cultivation of green drill crops, it has grown into general favour, and is now firmly established as indispensable to the success of modern farming; but with respect to wheat and other grain, it is still questionable in principle, and practiced only partially in a few counties of England. In Scotland it has hardly made any progress, and all sorts of corn are sown broadcast according to the ancient usage of the country; and a drill is not to be seen, except in potatoes, turnips, carrots, cabbages and beans. In fact, it has been found at once convenient, costly, and unnecessary to introduce horse-hoeing into the culture of white crops; and the increased produce has generally fallen short of defraying the additional expense. Land can be kept clear of weeds, and sufficiently pulverized, by the ordinary operations of a judicious course: and hence it is only

burdening the farmer with a great and unprofitable labour to subject him to all the hardships of the horse-hoeing theory. Its instruments, however, should be known; and such selected as are of acknowledged utility. Although we are far from being ready for the adoption of these into this Province, our views will be enlightened and expanded by becoming acquainted with such curious and complicated machinery.

The PATENT SWARD CUTTER is a substitute for Tull's four coultered plough to which I formerly alluded, and is supposed by many to be a capital improvement. It is drawn by two horses, and mounted on a frame, and its use is to cut old grass land into narrow strips of six inches; first lengthwise and then across, before it is tilled by the plough. It is composed of six iron cutting wheels, which may be placed nearer or farther from each other at discretion; and these are so contrived as to act independently of one another, and can be loaded with weights to pierce the toughest sward. They commonly work at the distance of six inches, sink into the ground from two to three, and thus chop the whole surface into small square pieces, which afterwards offer no resistance to the most minute subdivision. The four coultered plough only cuts the furrow one way, and lays it into strips: whereas this instrument penetrates the matted roots, and cuts up the field first in one direction and then another, and effectually prepares it for being easily and expeditiously brought into the finest tilth.

The cultivator is, I believe, of English origin, and is known to the agricultural world by a variety of names, which are all descriptive of the uses or benefits to which it may be applied. It is called a scarificator or scarifier, from the resemblance it bears to that surgical instrument, or from the supposed analogy subsisting between them; the one making incisions into the body, the other into the earth. It is styled an extirpator from the action of its teeth on root weeds, by which they are turned up and brought to the surface. The designation of a scuffler has been given it, from rather a bold stretch of imagination, by conceiving that it carries on a running and tumultuous fight against whatever is preventive of fertility; and its more common name of cultivator is expressive of its high importance in breaking and pulverising the soil. A modification of this implement has been lately introduced into East Lothian, and has received the application of *grubber, which is nearly synonymous with that of extirpator.

The shapes and construction of this instrument are almost as much diversified as its names; but there is a common bond of connection and similarity between them, suggested by the ONE purpose it serves in husbandry, and that is, the stirring and loosening of a light and recently tilled soil. It is useless either for grass or stubble land; and must, like the harrow, follow in the rear of the plough. But after the ground is broken up, and its cohesion in part subverted, no instrument can vie with it in effectiveness and utility. Towards the close of a summer fallow, or in breaking the crust of land ploughed in autumn,

* General report of Scotland, vol 1, page 222.

and which requires to be disturbed in Spring for the reception of the seed, it stands preeminent as a masterpiece of machinery. Admit, that it is ill calculated for any soil abounding in natural obstructions, such as stones or roots of trees, yet it would be all-powerful upon our rich marshes and fine intervals.

The two kinds of more frequent occurrence are, one with a square, and one with a triangular frame, in which the arms of the shares are fixed. The first is supported by four, the second by three wheels; and both so constructed as to let the teeth penetrate more or less into the ground. These shares are sometimes shaped like a goose foot, and sometimes in the form of a coulter. Their number may be varied with circumstances; and they are so spread out in the machine as to cover a width of four feet at a time. When two horses are attached to it an acre may be run over in about three hours, and the pulverization is most complete.

The DRILL PLOUGH is the next that comes under our observation, and is composed of three parts—the shares to make the drills, the boxes to drop the seed, and the harrows to cover it. There is no other instrument in Agriculture which has been constructed in such a variety of ways, and unites with more complexity the action of the different Mechanic Powers. It would be a vain attempt to follow it through all its changes and combinations, from the simple plough with its seed box, to Cook's Improved Drill Machine. The science of Mechanics has exhausted its capacity of invention in correcting, improving, and modifying its movements; and an account of any particular model, which gained a momentary popularity, would but ill correspond with that which may be the fashion of the day. Even in Tull's time, this ingenious agriculturist had brought it to such perfection "that with one horse he could draw a drill with eleven shares, making the rows at three inches and a half distance from one another; and, at the same time, sow in them three very different sorts of seeds, which did not mix; and these too at different depths. As the barley roots were seven inches asunder, the barley lay four inches deep. A little more than three inches above that, in the same channels, was clover; betwix every two of these rows was a row of sainfoin, covered only half an inch deep." But so fully convinced was he of the folly of such complicated machinery, "that he demolished all these instruments as a vain curiosity, inconsistent with the true principles and practices of the system."

The drill machinery is NOW pretty generally discarded in the sowing of all sorts of grain, and only retained in the culture of beans, turnips, carrots, sainfoin, and a few other green crops. A box attached to a plough, for the purpose of delivering the seed with regularity, and in rows, is used in many parts of Great Britain, and if I am informed right, has found its way here into King's County. This separate member of the instrument is of such simple construction, and of such eminent importance in the cultivation of turnips, that it cannot be too highly commended; and if, in place of connecting it with a plough, it

were affixed to a barrow, made for the purpose, and known by the appellation of the *DRILL BARROW, we would for some time stand in need of no more complicated apparatus. The great advantage of this barrow lies in its power of being accommodated, by an alteration in the size of the FLUTE or hollow part of the roller, to all descriptions of seeds; and it is equally useful in sowing beans, peas, turnips, as well as wheat, barley, and oats. This machine, along with the weeding and double moulded ploughs, should be added to the catalogue of our agricultural instruments, and would comprehend whatever the horse-hoe husbandry is compatible with our present condition, and conducive to our future advancement.

Halifax, December 3, 1818.

TO CORRESPONDENTS.

I am not able to acknowledge, as I would wish, the many communications sent me since my last letter. Two of them I have given to my publisher, which will appear under the Halifax head; and I must only express my gratitude for the valuable information conveyed to me by the rest. For the first time I am favored with a philosophical disquisition concerning the FOOD of plants, and CARBONIC ACID, from Gay's River, to which I shall soon attend, as I now enter on manures; and I have another from Truro, suggesting certain hints about opening new roads to the back settlements, under a fictitious name. I must take occasion here to state explicitly, that for the future I shall only pay attention to correspondents who give their real signatures; and as I have been now upwards of four months before the public, no man need hesitate to address me openly and without disguise. Any of my correspondents may still write me, and if they please interdict the publication of their letter; but in general this is unnecessary, for hitherto I have printed nothing in point either of language or sentiment, which would disgrace any man; and I have always taken the liberty, and indeed claim it, of correcting, partly suppressing, and often amending the communications sent me.

Of the thirteen letters last week received, I have nine with real, and four with fictitious signatures; and these last are respectable both in regard to intelligence, and the style of composition; but I am annoyed by their annonymous character, because I cannot correspond privately with the writers, to ask explanations, and direct their researches for the furtherance of my views.

ANNIVERSARY OF SAINT ANDREW.

On Monday this festival was celebrated in Mason's Hall, with more than ordinary splendour—the hall was handsomely decorated.

* I see in the 16th vol. of the Farmer's Magazine that the DRILL BARROW of wrought or cast iron, with a proper set of rollers, is to be had at Messrs, Small & Co. or at Mr. Morton's, both residing in Leith Walk, Edinburgh; and that the price varies, according to the size, from two to three guineas and a half.—A few of these should be imported next Spring by the Societies.

His Excellency the Right Honorable Earl of Dalhousie, Lord Kerr, Sir John Lewis, the Colonels of the Army, the Catholic Bishop, were among the guests. The dinner was excellent; and the wine of choice quality.

After many appropriate toasts were drunk in the course of the entertainment, His Excellency the Earl of Dalhousie rose to propose the health of a gentleman, who, though unknown to him, he was certain from his writings, deserved the appellation of a scholar and a patriot; and whose exertions in the cause of the country called forth the esteem of every friend to its welfare. He alluded to a public writer in the RECORDER, under the signature of AGRICOLA, who had excited the attention of farmers from one end of the country to the other, and begged most earnestly to recommend to the Province the great good his labours had already accomplished, and trusted that a Central Board of Agriculture would be formed in Halifax, and that this day they were now celebrating should be further distinguished as that on which such an institution was first proposed to be established. For his own part, His Lordship assured them that he would most heartily give it all the support in his power; and certain he was, there were many gentlemen, both present and absent, who equally appreciated the patriotic endeavours of the unknown writer, and who would most cheerfully contribute every assistance towards so laudable an undertaking. His Lordship added, he was truly sensible of the great benefits derived from similar institutions in Scotland, and he was thoroughly convinced the same advantages would accrue from them in this colony: because from his personal observation in those parts of the Province where he had travelled, His Lordship was satisfied the country was capable of great agricultural improvement, and only needed an active stimulus to industry to render it both flourishing and prosperous. His Excellency then gave: "To the health of Agricola, and success to his labours."

The toast was received with three times three.

The Hon. Judge Haliburton complimented His Lordship on the rapid strides lately taken throughout the Province, in the advancement of Agriculture, and esteemed the sentiments of His Excellency as another proof of the lively interest he took in the general prosperity and welfare of the country. He had no doubt, in fact, he was perfectly convinced, that when such an institution was founded, numerous individuals were ready to come forward and manifest their patriotic zeal in an object so desirable, and that by the commendable exertions of their ability, the anticipations of His Lordship would be realized and perfected.

REMARK.

I have extracted this from the newspaper of the day, because it was the first public testimonial of the Governor's approbation of these letters, and because the Provincial Agricultural Society dates its origin from the 30th of November, 1818.

AMHERST, COUNTY OF CUMBERLAND,

26th NOVEMBER, 1818.

TO AGRICOLA.

SIR,—Your noble and generous exertions, on behalf of the Agriculture of this Province, have at last aroused many of the inhabitants of this county from the apathy and indifference into which they had fallen with regard to the farming interests of Cumberland.

On Saturday last a number of the most respectable of them met at this place and formed themselves into a society, to be denominated the Cumberland Agricultural Society. They did me the honour of electing me President, and the following gentlemen to be the other officers of it, viz.: Mr. Stephen Oxley, Vice-President; Mr. William Baker, Treasurer; Mr. Elijah Purdy, Secretary; Mr. Thomas Roach, Mr. George Oxley, Mr. Samuel Freeman, Mr. Gaius Lewis, Mr. Joseph Oxley, Committee.

I am sure it will afford you pleasure to learn that your letters have effected (almost at once) what I have been in vain endeavouring to accomplish for some time past—the formation of an Agricultural society in Cumberland.

The meeting desired me to convey to you their heartfelt thanks for your benevolent efforts, and their warmest wishes for their success; assuring you that no exertion on their part shall be wanting to aid in effecting the beneficial objects which you have in view.

I am, Sir, your very humble servant,

J. S. MORSE.

REMARK.

This letter is to me very acceptable at the present moment, as announcing the establishment of a society in Cumberland, to form a link in the great chain by which our agricultural independence is to be secured. In contemplating these fruits of my labour, every thing like exultation is suppressed by the feeling of gratitude with which I am animated towards those who are, in this zealous manner, assisting me in the work. From the extent and importance of this county it is well entitled to set a noble example; and, I trust, it will be followed by others. To Mr. Morse, I return my thanks for the handsome way in which he speaks of my efforts, and I solicit his future correspondence.

No. 21.

ON MANURES.

IN the earliest and rudest beginnings of society, of which we have any historical records, mankind seems to have been experimentally taught, that crops of whatever description had a tendency to extract the riches of the soil, and that the waste must be repaired in some way or other. The first and most obvious method was to abandon the field which was exhausted, and leave nature to herself in the restoration of fertility. The plough always opened a fresh and virgin mould, and where land was abundant compared with the population, the defects of this system would not force themselves very readily on attention. But after cities began to be founded, and when man, tired of his wandering and pastoral life, sought the enjoyments and repose of a settled abode, it was soon discovered that recourse must be had to other means than the slow and lingering process of rest, to sustain and perpetuate the productive powers of the earth. Hence the origin of manures; and hence, too, the important station assigned them in ancient books of husbandry. The application of dung was indutiably of the earliest date, and was practiced by the Chaldeans, the Persians, the Phœnicians, the Carthaginians, the Greeks, and the Romans; but at what period the fossil manures were introduced into husbandry is uncertain, and like other important facts in the history of the arts, is involved in a dubious obscurity. We are informed, on the authority of Pliny,* that marls were known to the people of Gaul, and of Britain, and even to the Greeks; that the benefit of this manure lasted for years; and that they were distinguished into a great variety of kinds. Lime, too, about this period in Gaul came into repute, and from thence was slowly diffused over the surrounding countries.

Manures have been divided by agriculturists into two classes, both of which have distinctive characters, and perform different offices in the economy of vegetation. The first of these comprehends all animal and vegetable decomposing matter, and is principally instrumental in feeding the plant, in augmenting its size, and sustaining the vital energy. The second performs a much humbler part, and operates more on the soil and decomposing matter, than in directly contributing to the support of the vegetable; although even in this respect it is not altogether useless. The one has been called animal and vegetable, or putrescent manures; the other fossil, and sometimes septic and putrefactive. Whatever the name may be, the province of each is marked by precise boundaries: and it will beget confusion in the minds of my readers, unless they fully apprehend the distinction, and carry it along with them in any after train of reasoning. The putrescent manures, to borrow a familiar image, are the actual dishes served up at the table of the vegetable kingdom. By them all the various tribes are sustained

* Pliny Nat. History Lib. 17th C. 6 & 7

—the majestic oak as well as the lowly shrub—the poisonous weed as well as the medicinal herb—the corns—the grasses—the esculent roots —all feed on the rotting remains of animal and vegetable bodies: whereas the fossil manures, on the other hand, are merely the cooks, servants, waiters, and assistants at the table. Their business is to prepare and dress the nutriment, to bring it forward when called for; and they may be dismissed or retained at pleasure. Under the second class are ranked not only lime, marl, and gypsum; but sand, gravel, and clay; so that all the meliorations, which are effected on soil by blending and compounding the original earths, are comprised within its limits. In truth, all those operations are called manuring, which influence fertility; and it is thought of no consequence, whether this be attained by the actual supply of the food in the shape of dung, or by altering the texture and quality of the soil, in order that this food be digested and prepared. It would have been better, had two things so distinct passed under different appellations; for it seems an abuse of language to speak of manuring with sand, lime, or clay, and to classify these bodies under the same generic term with cow, sheep or horse dung; but perhaps, the origin of this verbal inaccuracy may be traced to the crude and imperfect conceptions of philosophy in the infancy of husbandry. When men first began to cart marl, lime and stable manure to the same field, they were extremely apt to think that all the substances served the same purpose in vegetation, and on that account gave them a common name.

The putrescent manures, from the high office assigned them in the vegetable kingdom, are foremost in importance and in dignity; and to them I shall first direct my attention. Here, again, I shall be under the necessity of recurring to chemistry, in order to derive my lights and explanations, for the whole process carried on in the growth and sustentation of plants is nothing else but a mysterious and beneficent application of chemical laws, modified a little by the powers of life, under the management of the Great Author of nature. Such of my readers as have either preserved, or can now have access to my tenth and eleventh letters, will review them attentively, imbibe the rudiments which are there taught, and thus furnished with knowledge, will come prepared to reap the full benefit of the present inquiry. To the ignorant and unlettered clown these letters must be unprofitable and unavailing; and without some effort on his part to master the science, and drink at the sacred fountain of philosophy, it is totally impossible for me to lower the tone of expression, and to familiarise the illustrations, to the dullness of an unenlightened understanding.

I shall appropriate the present communication to point out and enumerate what are meant by the animal and vegetable manures, and make a few observations descriptive of their general character.

All animals, when they die, quickly pass into a state of corruption. The elements of which they are composed, being no longer fixed and retained by the living principle, begin to separate, and hasten into new combinations. This arises from the joint action of

heat and air; and also from the affinities and repulsions which are ever taking place among the minute particles of matter. The body, whether left exposed on the surface, or buried in the ground, will in a short time disappear, and moulder into dust. The bones, although last in the order of dissolution, will exhibit gradual symptoms of decay, and in the end submit to the common wreck of organized existence. This decomposition, in every stage of its progress, is accomplished by the constituent principles of the body becoming fluid, and sinking downward—or assuming a gaseous form, and escaping into the atmosphere —the common receptacle of aeriform fluids. The carcase, which has lain under the earth for a hundred years, when disturbed in its asylum and dug up, has almost entirely evanished, and left nothing in its place, to render visible either its form, its bulk, or its consistence, except a black mould, as the last vestige of its being. Its volatile part has passed upwards, enriched the soil in its ascent, and again lives either in the vegetable or animal world.

When a vegetable is cut down, it submits to a similar destiny. If it be eaten, it is dissolved in the stomach, gives out part of its elementary substance for the support of the animal, passes forward through the gut by the peristalic motion, is voided, and thus adds to the contents of the farm yard. If not eaten, it undergoes the putrefactive process of its own accord, and the only difference is that none of its component parts contribute to the maintenance of animal life, but are wholly resolved into chemical products, and an earthly residuum. In both cases, it equally passes into its original elements.

The excrementitious matter or dung of all animals is no other than the remains of the vegetable or animal food which has been received into the stomach, undergone there a partial dissolution, and been thrown out as unserviceable for future nutrition of the system. From this universal decay of organized matter, and its conversion into gases, it would seem that animal and vegetable substances, and excrementitious matter are resolvable into each other, and are only different states of the same original principles. When we call in the aid of chemical analysis, this conclusion, seemingly so violent and irreconcilable with our prejudices, is not strengthened but confirmed, not probable but certain, not questionable but undoubted and infallible. The essential principles of them all, are hydrogene, carbon and oxygene, in various proportions, either alone, or in some cases, conjoined with azot. These four bodies, by their endless combinations with each other, can assume every variety of form, and meet our eye either in the solid, the fluid, or gaseous state. Hydrogene by its union with oxygene forms water; with azot appears as the volatile alkali, or ammonia. Carbon, again, combines with hydrogene into various inflammable bodies, possessing a manifest graduation in the density and brightness of their flame; and with oxygene into carbonic acid. Oxygene itself is the most restless of them all, enters into the composition of air, of water, and of earth; forms the fixed alkalis, and most of the acids; and performs an important part in the functions of the animal economy.

Azot is no less active in its compounds; and with oxygene constitutes the nitric acid, nitrous gas, and nitrous oxid. This is not all. These compounds again unite either with the simple elements of which they are formed, or with one another, and thus multiply an unlimited variety of products, which appear in the animal and vegetable kingdoms. "Gum* and sugar contain nearly the same principles, and starch differs from them only in containing a little more carbon. These three products are convertible into each other. Thus, in the ripening of grain, the sugar, conveyed into it by the sap vessels, coagulates into starch; while in malting, the converse takes place, and the starch in grain is converted into sugar." During fermentation, a change is effected on the elements of sugar, from which ardent spirit results. Part of the carbon combines with oxygene, and escapes in the form of carbonic acid; while the remaining, hydrogene, and oxygene unite to form alcohol.

It is unnecessary to confound my readers with further details: suffice it to say, that when we analyze a vegetable, it consists principally of hydrogene, carbon, and oxygene, with a little azot in some species; when an animal, it contains a greater portion of azot with the other three ingredients. Dung also, in a state fermentation, gives exactly the same results, being in reality just animal and vegetable matter, with the additional circumstance of having passed previously through the intestines. It is thus easy to see, how putrescent manures supply nourishment to plants; and how plants taken into the stomach support animals. The fact is, the same original elements are only passing into new combinations, and assuming the forms either of vegetable or animal life. It is as easy to discover how the disorganization of living substances should contribute to fertility, and invigorate the growth of crops. We may then safely draw this general conclusion, that whatever has lived in air, in earth, or sea, will form manure, when the system is destroyed by corruption; and that whatever has grown and enjoyed vegetable vitality, either on the surface of the earth or under water, will also furnish the pabulum or food of plants, when it has been resolved into its elements by fermentation.

The ANIMAL MANURES, then, are the fleshy fibres of the body, the membranes, the bones, and blood which constitute the inward part; the hair, wool, and feathers which are the external covering; and the horns, claws, and hoofs, which tip the extremities. These, it is true, decompose at different periods, and require a different treatment; but they are all resolvable into the same simple elements. The fish which swim the ocean, the feathered tribes, man—the lord of the creation, quadrupets of all kinds, reptiles and creeping things, and the diminutive and almost invisible grubs which infest the soil, equally contribute by their dissolution to the fertility of the earth.

The VEGETABLE MANURES are, the roots, stems, leaves, fruits, and seeds—the gums, oils, and essences of all plants, shrubs and trees; in

* Sir H. Davy's Lectures.

short every part of the vegetable, if only brought into fermentation. The most noxious weed in this respect is as valuable as the finest flower, the leaves which are tossed in the autumnal blast, as the straw which is collected and preserved for the barnyard. The only difficulty here is, to apply the fermenting process to the woody part of stems and roots; but whenever this is impossible, fire is employed to reduce them to their component elements. Hence the necessity of burning, when fermentation would be of no avail; but in all cases this must be resorted to as the last remedy, for by far the greater portion of the vegetable substance is dissipated by the flame, mounts into the atmosphere as vapour, and is irretrievably lost.

EXCREMENTITIOUS MATTER may either be the remains of animal substances only, as that of the carnivorous tribes—or of vegetables only, as that of the domestic and working cattle—or a mixture of both, as that of men, dogs or cats. The first is the richest, the second the poorest, and the third occupies an intermediate place between the two; and the cause of this is obvious without any laboured demonstration. Flesh is clearly elaborated from vegetable food, and, as it were, contains its substances concentrated into small space, just as ardent spirit does the essence of grain. The beast of prey, therefore, that lives on flesh, must discharge a richer matter than that which is sustained solely by pasturing; and night soil has been found to be vastly more fertilizing, bulk for bulk, than the best barnyard manure. The urine of all animals is a strong and effective stream of putrescible matter, which should be carefully collected and conveyed to earth prepared to absorb it.

These general views will enable us easily to account for the influence of certain manures, which have been mentioned by writers ignorant of philosophical principles, and who have bestowed great pains to convince us of what is plain and indisputable. There is no necessity of appealing to a series of experiments to establish that all parts of animals and vegetables—their secretions—their products—their recrements—their remains—possesses fertilizing qualities, because the original elements, of which they are constituted, are the means contrived by nature to renovate and sustain the powers of vegetation. The decay of one race supplies materials for the growth of another; and the past generations of rational and irrational beings have long ago been reduced into their simple component parts, live again in new forms, and are revolving in a circle of endless and unceasing vicissitude. Soot is a product from the burning of coal or timber; Rags, if woolen, belong to the animal; if linen or cotton, to the vegetable manures. The cuttings of the felt-monger, of the tanner, of the shoemaker, and of the furrier; the cakes of the tallow-chandler, of whose virtue so much has been spoken, whale-blubber and fish oils, the refuse of the glue-maker, are all obviously of animal origin: whereas the scum of sugar refinery, bleacher's leys, malt-dust, oil-cakes, derive their fertilization from the vegetable kingdom. There are other manures, such as the washings of the soap-boiler, which are connected

with both; and I know, indeed, of no exception to the rule, that "WHATEVER HAS ONCE LIVED ON THE EARTH, OR UNDER THE WATERS, BY THE RESPIRATION EITHER OF LUNGS OR LEAVES, MAY BE CONVERTED BY DECOMPOSITION INTO THE FOOD OF PLANTS."

Animal and vegetable manures are distinguished by one common character; namely, they act only by being subjected to the putrefactive process. Should this be prevented or retarded by any obstructing cause, the substances remain unaltered and minister no fertility to the soil: neither can they—for as they operate solely by their own decay, whenever that is suspended, their utility is at an end. It is the combination of their elementary principles into new forms, and the tendancy of these principles to unite with living existence, that give them the stamp and character of manures: and therefore, without putrefaction they are entirely inefficient. This doctrine cannot be better illustrated than by adducing peat—a substance which exists here in abundance, and naturally accumulates within certain parallels of latitude, where the temperature and other concurring causes are favourable to its growth. It is an inert vegetable heap formed by a singularly chemical change on the aquatic plants and grasses which spring up and thrive in damp situations. It is composed of successive annual layers which have been gradually collecting—the remains of the present crop forming a bed, and supplying a basis to the next. From the the presence of water putrefaction is arrested, and the *peat goes on increasing in bulk, and rises often to a very considerable height. This mass is in reality an unfermented and living dunghill; and all that is necessary to render it beneficial is to remove it from its seat, expose it to the atmosphere and other solvents, and bring on decomposition. The collection of the putrescible matter in bogs and and standing water requires to be subjected to the same process; and after being similarly exposed to the sun and air, it rapidly dissolves and repairs the waste of the soil.

I observe further, that putrefaction in every instance goes on by the elementary principles being set at liberty either in a fluid or volatile state. If a quantity of stable dung be piled into a heap, and freely exposed to all varieties of weather, it soon heats, and emits a constant stream of vapour. As the gasses are escaping, it is constantly diminishing in weight and volume, and by the end of six months, if there have been alternate moisture and warmth, not above a fourth of the original bulk remains to be spread on the field, and this is always a

* The natural history of peat is no longer a subject of controversy. It is formed of the successive deposits of those plants which vegetate naturally under the circumstances of situation, heat, and moisture where it is found: but the farther changes to which it is liable, is matter of curious, and at present of ardent research. The inquiries are not yet fully completed, but they seem tending to one grand conclusion—that peat is an intermediate stage between vegetable matter, and lignite into which it passes by a regular process of bituminization, and that it is capable, by mere pressure, of a further conversion into coal. The resemblance in composition and stratification between the two is remarkable. In coal, remains of various plants are found, which present botanical characters indicating an aquatic origin. Its position, so far below the present surface of the earth, may be easily explained by geological analogies. The beds of limestone abounding in shells, and other organic relics deposited at great depths, show that the soil on which we tread is of secondary formation; and that the globe has undergone revolutions as well as its inhabitants. It is not more wonderful that the peat-mosses of a primeval age should furnish us with the fuel of our chimnies, than that its shells should now appear in the marble which decorates the mantelpiece.

blackish earth, mostly of carbonaceous matter. All the other ingredients, consisting of the hydrogene, oxygene, and azot, with part of the carbon in the form of carbonic acid, are partly sunk in the soil, and partly blended with the atmosphere. I admit, the latter are not lost in the general system of the universe; but carried by the winds, they combine anew with some living vegetable, or enter into some equally useful compound; but lost they are to the farmer beyond all recall. They may enrich his neighbor's crop, or be fixed and entangled in the luxuriance of the forest, but they can never reward his labour, nor impart plenty to his harvests. The nutritive juices may have passed downward, and fertilized the spot which it covered, but the substance is evaporated, and as completely gone, as if it had been consumed by fire.

I must say, that the philosophy of manures is grossly misunderstood in this Province, and that almost every reader, from what I have advanced in the opening of the subject, will be struck with the errors of his past management. The escape of the vapours is the most wasteful prodigality. The stream of rich putrescible matter which is issuing from all our barnyards, from the emptying them in Spring, till the frosts set in and arrest the profusion, is a signal instance of the want of all scientific knowledge in the economy of our rural affairs, and tends to prevent that extended culture of WHITE CROPS which alone can work our salvation. A grazing country may subsist with a total inattention to the collecting and preserving of manure; but the appearance of the plough will sharpen invention, and set industry in motion to swell and enlarge the quantity. A Flemish husbandman—and this is the general character of the people—upon a small farm can keep four milch cows, as many heifers, with a proportionable number of pigs and poultry, and annually plow and sow fifteen acres under wheat, turnip, barley or flax, only reserving five acres of hay and pasturage for all these cattle, and two horses besides; and this he accomplishes by the possession of a secret of which we are entirely ignorant—a sedulous and well directed anxiety about his dunghill.

Halifax, December 9, 1818.

TO CORRESPONDENTS.

The length of my letter on Manures, and the importance of the approaching meeting for the establishment of the Central Board, forbid me to extend my note to correspondents. I have, since my last, a great variety of communications, some of which I shall soon publish, as they contain valuable matter. The first of a series from "Rusticus" claims a distinguished place; and I acknowledge him the more readily, because he has given me his real, and only appears to the public under a borrowed name. I thank him and his friend in town for making me the depositary of the secret, and for the profession of their confidence, which will be requited by giving them all the aid in my power. The

lady, who writes from Windsor, is worthy of my warmest acknowledgments. Amid the hurry of my present engagements, my heart, by a sort of involuntary sympathy, gave and dropped the tear over the grave of the "loved, respected name," and I shall enter with hallowed reverence the library of the "practical Agricola of his day" which she so kindly throws open to me. I must express my gratitude to Mr. Toler, for the mark of approbation in so handsomely bestowing on me his improved map of the Province; and I would recommend the work to the friends of Agriculture. To Mr. Owen, I am also under obligation for Hale's Husbandry, and I shall endeavor to extract from it what I account useful to the country. My other numerous correspondents must be satisfied with my general thanks, and although I cannot individually mention them, their hints shall not be forgotten.

ANNAPOLIS, 4th December, 1818.

MR. HOLLAND.

SIR,—I am desired to request that you will publish the enclosed communication; and I feel much pleasure in stating that the letters of Agricola in your paper have had the effect of creating a spirit of emulation and zeal to improve and promote the Agriculture of this extensive and valuable country, which was strongly exhibited at this meeting.

I am, Sir, yours, etc.,

HENRY GOLDSMITH, Sec'y.

At a meeting of a number of gentlemen and respectable freeholders of the Eastern District of this county, assembled at the Court House, in Annapolis, on the 1st day of December, 1818, in the presence of the High Sheriff, it was resolved to form an Agricultural Society in the Eastern District of this county, to be called "The Annapolis Agricultural Society," for the promotion of good husbandry, and rural economy. At this meeting the following officers were chosen:

President—Peleg Wiswall, Esq.; Vice-President—Thomas Ritchie, Esq.; Sec'y and Treasurer—Henry Goldsmith. Esq.

Committee for Annapolis Royal—Rev. John Milledge, William Winniett, Esq.; Thomas Ritchie, Esq., J. P.; John Fitzrandolph, Esq.

Committee for Annapolis Township—John Whitman, Esq.; John Reid, Esq.; Pardon Saunders.

Committee for Granville—Rev. George Best, Thomas Bogart, John Croskill.

Committee for Clements—William Jones, Esq.; Isaac Woodbury, John Ditmas, Jr.

Before the close of the meeting, the Vice-President very liberally undertook to provide, at his own expense, three ploughs, of the pattern and description recommended by Agricola, and to place the same at the disposal of the society.

TO AGRICOLA.

SIR,—I have the pleasure of informing you that a numerous and respectable meeting of the inhabitants of this settlement was held here on the 20th ult., when an Agricultural Society was formed, of which I had the honour to be chosen President. I trust you will not long have any just ground to reproach us with our want of interest in the agricultural prosperity of the Province, as there are numbers here who seem to enter with ardour into the matter, and we will try to muster as much skill as will serve to direct that zeal, and turn it to a good account.

I am, Sir, your servant, and well wisher,

THOMAS TROTTER.

Dorchester, County of Sydney, Dec. 2nd, 1818.

REMARKS.

The establishment of these societies must give real pleasure to the friends of Nova Scotia. The first is founded in a county, which is next in extent to that of Halifax, is watered by a noble river—skirted with interval and marsh lands, and which embraces within its bounds the North Mountain—one of our best upland tracts. I am truly glad that the second capital of the Province has given this fervent display of its zeal in the promotion of our agricultural interests, and has selected gentlemen of such acknowledged ability to preside over its affairs. There has been a remarkable wisdom shown in the appointment of the subordinate committees, to watch over the prosperity of the respective townships; and in thus making choice of men belonging to each either to act separately or as a joint committee, the interests of the whole are most effectually secured. The influence of the society, too, by this plan is propagated and extended, and acquires, as it were, a "local habitation and a name" in every spot where these office-bearers reside.

The second communication, from the Rev. Mr. Trotter, announces the formation of a society in the county of Sydney, of which he is chosen President. I rejoice in this appointment, because from a very respectable source, I learn that he is eminently qualified for the office, and indeed I have the means of judging myself, and I beg of him to accept my congratulations. He seems solicitous to wipe off the reproach I cast on the county, and promises to cherish the growing zeal for its improvement, and to give it a skilful and beneficial direction. I shall thank him to transmit in course the names of the other officers, and also the designation of the society itself.

A PUBLIC MEETING.

Events are now drawing towards a crisis, and seem big with importance. The Province from the one end to the other is awakened, a spirit has gone forth to quicken and reanimate; the counties are vieing with each other in manifestations of zeal; individuals are offering costly sacrifices on the altar of public utility; private intimations are given me by distinguished characters of the speedy importation of the drill machinery, and hope is thus gilding our future prospects with its brightest coloring. I have never witnessed such a general excitation of public feeling—the happy and infallible prognostic of our rapid advancement. Men of all ranks and conditions, even females respectable for age and virtue, have caught the prevailing ferment, and written me in a tone of interest and ardent expectation. To accuse this country in future of a want of public spirit would be the vilest profanation. We have men amongst us in all parts of the Province whose bosoms glow with the warmest enthusiasm, and who are ever ready to step forward and advance the common weal. I cannot refrain from bearing this honourable testimony of their zeal, activity and patriotism. All appearances confirm me, in addition to my private information, that ere long agricultural societies will be founded in every proper and eligible situation, and that the Province will be fully and systematically organized.

My Townsmen and Fellow-Citizens:

Have you any interest in this declared agricultural spirit? Is the internal improvement of the colony to bring you any advantages, for which a becoming and corresponding feeling on your part should be shown? Surely I need not dwell on the incalculable and numberless benefits which we all will derive from the advancement of our husbandry. If the farmer, in addition to his present supplies, can raise our bread, he will be to the merchant and tradesman a more valuable customer, and to the revenue a larger contributor. The specie which has been drained to the States will circulate among ourselves, swell the sources of our industry, and give facility to mercantile enterprise. Population has always been found to keep pace with the means of subsistence, and so soon as we have a disposable stock of provisions, our numbers will multiply in the exact ratio of superabundance. Our fisheries, our infant domestic manufactures, will all receive a spring and impulse from extended cultivation. Here that foolish contest, which existed so long in England, and was agitated with so much heat, between what was called the COMMERCIAL and the LANDED INTEREST can have no place. The British merchant has long discovered that in depressing the state of property, and in clogging agricultural improvement, he was warring against himself, and sacrificing those very advantages he was anxious to attain. The two bodies have now entered into the most intimate union, and experimentally found that

manufactures, trade, and national prosperity always flourish in the track of the plough.

Halifax, being the seat of the government, the capital of the Province, and the centre of its wealth, is clearly designed to be the station of the Central Board. In all directions around us, agricultural societies have been formed, or are forming. There is a rapid and vigorous circulation at the extremities, and as yet, no pulsation at the heart. This, I know, has not arisen from any indifference to this great national concern; for the town has been forward and exemplary on all public occasions. In the "Waterloo Subscription" you were generous, I had almost said, unbounded; and in every case of private distress the hand of charitable benevolence is ever open. As AGRICOLA, I durst not presume to convene you for the purpose of forming a society, and you have waited till the summons has come from the proper quarter.

I have to announce, then, that His Excellency the Governor has done me the honour of making me the organ of his wishes to the public, and that on Tuesday next, midday, at the Mason's Hall, a meeting of the respectable inhabitants is called in order to consider the proper measures to be taken for the formation of a Central Society; and he has been graciously pleased to signify that he will take the chair on the occasion. As His Lordship at a late festival first proposed to establish this institution, and as the idea originated with himself for the general good, I cannot help congratulating the Province on the anxiety and zeal which he has ever manifested in promoting its best interests; and his present conduct must in all time coming, endear to the inhabitants the memory of his administration. Acts of public goodness are never forgotten, even by the ungrateful.

No. 22.

ON MANURES.

TOWARDS the conclusion of my last letter, I made two remarks illustrative of the general character of putrescent manures, which I wish to impress upon the minds of my readers, not so much on account of their philosophical importance, as of their practical utility. I said that they act on vegetation solely by being subjected to the putrefactive process; and that this process goes on, at least in part, by the elementary principles being set at liberty, and passing off in gases or ascending steams. It must not, however, be supposed, that their escape is essentially necessary to decomposition; for Nature has provided means by which they may be arrested and applied to use. Without some contrivance of this kind, we could never have availed ourselves of the efficacy of manures, nor recruited our fields after they had been worn out by successive cropping. It is then a matter of pre-eminent and commanding interest, and of useful and practical application, to ascertain those means which are efficient for absorbing the gases disentangled in all the stages of fermentation.

These are chiefly two—WATER and EARTH: and I shall briefly set forth and explain this new view of the subject, and exhibit its bearings on the point at issue.

WATER is the great and universal solvent, and exerts a mighty and decisive influence on the economy of the vegetable world. There is not a more familiar instance of the power of water in dissolving bodies, than the disappearance of sugar when immersed in it. Plunge a piece of loaf sugar into this fluid, hold the glass between the eye and the light, and the following changes are perceptible. Small air bubbles pass in quick succession, and fly off at the top; while the piece gradually diminishes in bulk, and evanishes at last from the sight. The water is then said to hold it in solution, and becomes tinctured with new properties both in its colour and taste. This power, however, of dissolving is placed under certain limitations, and varies according to the nature of the bodies exposed to its action, and to the temperature of the fluid. Thus, to the former solution continue to add sugar till it no longer melts, but lies at the bottom of the glass without any sensible alteration. The water has, by this time, taken up as much as it is capable of suspending, and it is said then to be completely SATURATED—such being the term used in the chemical nomenclature: but on the application of heat the power of the solvent is increased. When a fluid, then, of any kind is saturated with a substance on which it acts under a given temperature, it loses over it all further efficacy, and the body remains at the bottom without suffering any change.

I observe again, that WATER not only dissolves solid bodies, like that above mentioned, but it is susceptible of holding in solution gases or steams, and in this manner hindering their escape. The volatile alkali is one of the products arising from the decomposition of animal

matter, and water absorbs it with great rapidity: so that *100 grains of the fluid will actually fix and retain 190 cubic inches of the gas, and a cubic inch of water takes up 475 cubic inches of the gas, according to Sir H. Davy's experiments. Carbonic acid, which also arises from putrescent substances, is greedily absorbed by water: and the common method, by which this gas is prevented from mingling with the atmosphere, is to bring it in contact with water, by agitating which the absorption is remarkably promoted. It is needless to multiply examples, because every chemical student knows, that the gases can only be handled for ordinary use, by the instrumentality of some fluid which is charged with them.

On this property of water depends principally its influence in sustaining vegetable life, from the moment the seed germinates to the last stage of maturity and death. The roots are spread out in the soil, and by their absorbent vessels collect the sap which is there distributed This sap, holding in solution the gases and soluble matter, which are perpetually forming from the corruption of the putrescible substance enters the extremities of the fibres, is carried thence to the stem, passes upwards to the branches and the leaves, and is there perspired into the atmosphere; while the elementary principles of food, which it held in solution, have been separated by the secretory organs and converted to the support of the plant.

Hence it is, that as vegetables languish in the richest mould without the presence of moisture, to carry on the necessary processes; and that the hopes of the husbandman are cut off by the failure of rain. The circulation of the blood is the grand mean, by which the waste of the animal system is repaired, and by which too its members swell to their just proportions; so the ascent of the sap is an analogous contrivance to enlarge the bulk of the vegetable, and sustain the principle of vitality.

I remark lastly, that if we pour water on a heap of stable or cow-dung in a state of fermentation, it flows out at the bottom altered in its colour, taste and smell. It becomes impregnated with new substances which it has gathered in its passage through the dunghill, and although it be still water, it holds in solution the results of the decomposition; and if it be deeply black and putrid, it is a certain indication of its being entirely saturated. To suffer this, therefore, to run off without any care or trouble is most culpable mismanagement, and a flagrant violation of the soundest maxims of rural economy. This putrescent stream contains the very essence of the manure, and should either be scrupulously confined within the limits of the dunghill, or conveyed to fresh earth that it may impart its nutritive qualities. Thus, by the aid of chemistry we have reached a second conclusion of manifest utility in the collection and preservation of manure, and no less important than the first which we attained in relation to the escape of ascending steams.

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*Henry's Chemistry, chap. 7th, section 2nd.

When these chemical results are extended to the common practices in the Province, what a lesson of reproof do they inculcate! and how strongly do they impress the necessity of reformation! We have few barnyards constructed on scientific principles, and I shall hardly escape derision in thus prostituting science to so abject and mean an inquiry. Let such, however, as feel disposed to be merry at my expense, pause in the midst of their triumph, and meditate the value of this agricultural axiom, "Manure is the mother of Corn," and believe, not on my authority only, that the collecting of it lies at the foundation of all good husbandry. So little are our farmers convinced of this truth, that more than the half of the manure made in the Province is absolutely wasted from ignorance and inattention; and the other half much less productive, than it would be under more skilful direction. From many of the dunghils, which have fallen under my own observation, a stream of rich liquor is allowed to flow in copious abundance, and to sink in the earth; or as I saw at Onslow in one instance, is conducted by a drain, formed for the purpose, into a neighbouring brook. When I challenged this useless and unprofitable waste, the good man smiled at my admonitions, and remained unmoved by my reasoning; and I have little doubt, but to this day, the dunghill stands on the same declivity, discharging its richness into the passing stream.

EARTH, too, is a powerful absorber of all the gasses which arise from putrefaction. This position is not new in the present stage of our agricultural research, as it will be found illustrated in the twelfth letter, when treating of the purposes which the soil serves in vegetation. It is unnecessary here to recapitulate the conclusions which are there abundantly established; and I shall take it for granted that the earth possesses the property, not only of retaining the putrid steams which are formed from the decay of decomposing bodies within itself, but also of attracting the effluvia when floating in the air. The salubrity of the country depends on this latter quality; as the practice of burying the dung under the furrow is founded on the former. The stench proceeding from the dissolution of organized matter never rises through the ground to assail the nostrils; although it is sufficiently offensive from bodies corrupting in air or water. A strongly dunged field, after being ploughed, sown and harrowed, sends forth a healthful and refreshing smell—a proof that all the putrid vapours, which otherwise would annoy us, are absorbed and retained for the nutrition of the crop. It is on this account that the poorest earth can be enriched in a very high degree by mere exposure to the gases of putrefaction. Put a layer of common soil along the top of a fermenting dunghill, from 12 to 18 inches thick, and allow it to remain there while the process is carrying on with activity, and afterwards separate it carefully from the heap, and it will have been impregnated with the most fertilizing virtues. The composts, which of late have attracted so universal attention, and occupied so large a space in all agricultural publications, originated in the discovery of this absorbing power of the earth, and in the application of it to the most beneficial of purposes. A

skilful agriculturist would no more think of allowing a violent fermentation to be going on in his dunghill unmixed with earth or other matter, to fix and secure the gaseous elements, than the distiller would suffer his apparatus to be set to work without surmounting his still with the worm, to cool and condense the rarified spirit which ascends in evaporation. In both, the most precious matter is that which assumes the aeriform state; and to behold it escaping with unconcerned indifference, is a demonstration of the most profound ignorance. The essence of the dung in the one, and of the grain, cane or grape in the other, is transforming by the action of heat into one of those states, of which all material bodies are susceptible.

Further, the earth not only absorbs the putrid gasses which are formed within itself, but it extracts them from the water which is circulating through its pores. Take the black rich liquor which issues from the dunghill, and which is saturated with vegetable juices and vapours, pass the same through a quantity of mould of sufficient thickness and consistence, and from the bottom will run a stream of purified and clear water. All the putrescent materials, which were blended and incorporated with the fluid are separated by the percolation, lodged in the earth, and the water sinks downward refined from every gross and foreign admixture. The rains which fall on the surface of the globe soon become turbid and discoloured encounter in their course substances of unclean and loathsome appearance, and are thus rendered nauseating to taste and smell; yet these waters, by simple straining through the earth, feed the subterraneous springs, which burst at the feet and sides of the mountains to quench the thirst of the animal creation. Their passage through the earth is in itself a process of the most complete purification; and the stagnant pool, which swarmed with reptile life, and from the use of which we would have turned with loathing and abhorrence, is bereft of all its noxious taints, so soon as it overflows, meanders on the surface, and descends to the bowels of the earth.

In the course of this, and my last letters, we have been conducted to three grand conclusions, which I shall state distinctly and in form; and then proceed to point out their practical utility in the formation of dunghills.

1. During fermentation, the gasses into which animal and vegetable substances resolve themselves, naturally fly upward and mix with the atmosphere.

2. These gasses, when they pass through water or come in contact with it, are absorbed; and they change its colour, taste and smell.

3. Earth or soil possesses the power, both of arresting the gasses in their ascent, and also of separating the soluble matters from water which holds them suspended, by the mere process of filteration.

These philosophical deductions will guide the farmer in the preserving and gathering of his manure with a certainty and success—highly conducive to his private interest, and no less so, to the national

prosperity; and although to many, the pains which I have taken in establishing them, and the variety of detail through which I have travelled, may seem unnecessary and irksome, it should be recollected that my prime object with the public has been to advance Agriculture to some degree of dignity; to delineate its intimate connection with science, and thus to allure the wealthy to a walk of industry by no means vulgar and ignoble; but a fit occupation to the gentleman; an instructive and delightful pursuit to the scholar, and a healthful and solacing amusement to independent old age.

It would be injudicious to recommend here the identical plan of construction for a dunghill, which is prevalent in England; yet, at the same time a brief description of this necessary part of farm building as conducted at home, would not be altogether useless. The general principles are the same in all places, and in all countries; although the manner of applying them may be different and accommodated to circumstances. The outhouses or offices, attached to every farm of any extent, are generally arranged in a square form, leaving an area in the centre which is surrounded on all sides by a foot pavement. Here a pit is opened, varying from two to three feet in depth, and proportioned to the size of the area; paved either at bottom with flag stones or coated with clay. The cow house, the pig sty, the feeding stall, the stable, all are so contrived that the urine and vegetable juices, in the separate subdivisions flow inward, and empty themselves into this excavation. It is the common receptacle of all the dung made by the cattle; of the refuse of the kitchen; of the sweepings of the barn floor; and, in short, of all the waste of the farm.

First of all, a coating of common mould, by most of the enlightened and scientific agriculturists, is spread all along the pavement of the pit, from nine to fifteen inches deep, according to the convenience or fancy of the operator. On this the manure is laid, as it is brought by a wheel-barrow out of the different offices and stalls. When fermentation becomes violent, and this is indicated by the heat and strength of the vapour, the cleansing of ditches and roads, or, in want of these, common earth, are carted often from a considerable distance, and regularly spread over the dunghill. The gasses are thus absorbed and prevented from escaping; and recourse is had to this remedy whenever the rapidity of the putrefactive process points out its necessity. According to this plan, there is no waste nor carelessness in the management of the manure. The mould at bottom imbibes greedily the saturated liquor which sinks downward; and that, which is intermingled with the whole mass, fixes and retains the gasses—so often described as the elementary principles of the decomposing matter. From experience, it is discovered that the earthy materials which are thus added to the animal and vegetable substances, are impregnated with as nutritive virtues as the dung itself; and that they increase the bulk and value of the manure by their whole amount. Nay, so attentive are some farmers, that they empty their dungstead twice or thrice during summer, cart the contents to a field for which they are

destined as a dressing, and form there a new compost on the same principles. A layer from the barnyard is first spread down in the form of an oblong square or parallelogram ; above this is laid either earth, or the surface sward cut off by the spade ; again, another layer of dung ; and so on alternately, till it is raised to the height of three or four feet. The sides and the top are then covered over with soil ; and in this state a new fermentation takes place, and all the gasses are confined within the boundaries of the heap. In this manner the skilful occupier of land multiplies his manure, repairs the waste of decomposition, and exerts a philosophic control over the powers of fertility. Sometimes he turns over the mass, piles it up anew, brings on a third fermentation, and thus all the seeds of weeds, originally carried into the barn along with the hay or fodder, and from thence mixed up with the dung, are effectually destroyed. This valuable compost, freed from all deleterious matter, and rich in vegetable food, is spread on the soil, instantly ploughed in, and never fails to compensate the labour which has been expended in its collection and preservation.

Halifax, Dec. 16, 1818.

TO CORRESPONDENTS.

The interest of these papers is still increasing, if I may judge by the number and variety of communications. The Agricultural columns of the RECORDER are so much occupied by the different details and important events of the week, the insertion of which was unavoidable, that I must defer giving to the public several hints which have been sent me. One suggests the possibility of rooting out trees by a machine, and seems confident of success. Let him construct and send a model, and even although it may not be effectual for tearing out the tree in all its vigour and strength, it may be applied to the stumps in a very early stage of their decay. Agrestis' proposal shall be prepared for the public eye ; and Mr. Clarke's ley water has been received, and notice shall afterwards be taken of his letter. I have acknowledgments to make to the Rev. R. Blackwood ; to Messrs. Flieger, Moore, and Blanchard ; and also to Messrs. Lydiard & Story for the liberal encouragement they have given to the raising of barley, by offering in a public advertisement, to pay IN CASH one dollar per bushel for what is delivered to them, well cleaned, in the Fall of the year. This secures to the farmer a price and market, and will save to the country four thousand dollars, which these gentlemen send annually to the States for this article.

Extract from the ACADIAN RECORDER dated Saturday, December 19, 1818 :

On Tuesday last, the 15th instant, pursuant to public notice, his Excellency the Governor and a great number of respectable inhabi-

tants of the town, assembled at Freemason's Hall, to consider of the most proper measures to be taken for the formation of a Central Agricultural Society.

His Excellency, about half-past twelve o'clock, took the chair, and opened the purpose of the meeting in a very appropriate and handsome speech. A wish, he said, had been expressed that he should preside on this occasion—a wish with which he most readily complied, not only as rendering obedience to the call, but because he considered it his duty to be foremost in matters connected with the prosperity of the Province. The advantages to be derived from Agricultural Societies had been so ably discussed in the letters of Agricola that little remained for him to urge in their behalf; and he should only say, that the public mind had been impressed with the conviction, both of the necessity and propriety of encouraging Agriculture. His Lordship said that he felt his acknowledgments were due to the unknown writer for the impulse he had given to the general energies of the Province; but as it was extremely probable that the gentleman was that day present, although to himself entirely unknown, he should abstain from expressing his full sentiments of approbation, as he wished neither to flatter nor offend him. Agricola had succeeded, however, in rallying around himself the enterprise, talent and respectability of the country; and to him we were indebted for that emulation and activity which prevaded all classes in promoting and encouraging agricultural pursuits. His Lordship further remarked that it was customary, on such occasions, to explain from the chair, the objects of the meeting, and the advantages likely to arise from carrying them into execution. The principal object, certainly, was to give effect, as far as their means and influence would enable them, to the plans of Agricola; to assist him in his work, to follow up his success, and to take from his shoulders part of the burden he had sustained for the public good. The advantages of a Central Society would be to act in concert with, and give direction to those formed in the different districts and counties, to increase the common stock of knowledge and to communicate it throughout the Province; and thus lend a new vigour to the industry of the farmer. His Excellency concluded by stating his readiness and anxiety at all times to advance the public interest; and with these remarks he left it to themselves to adopt such measures as they might deem most conducive to attain the objects of the meeting.

S. G. W. Archibald, Esq., then rose and observed the present meeting had been called by the sanction of His Lordship, for the purpose of considering the proper measures to be adopted for the formation of a Central Board of Agriculture in this town; and he was persuaded it would be considered quite unnecessary by His Lordship, for him to state fully, at this time, how much we must, one and all, esteem the kind condensation of His Lordship in taking the chair on this occasion, and giving his countenance and support to the proposed institution.

The inhabitants of the Province, from their peculiar circumstances, required much general information as to agricultural pursuits; at the time of the first settlement of the country agriculture had not attained even in Britain, any great degree of perfection, and no opportunity has been afforded them of witnessing the beneficial effects of modern improvement. In reducing a wilderness country to a state of cultivation, the most valuable lands were taxed for the support of its inhabitants by constant and vicious culture, far beyond their natural strength; and consequently became weak and exhausted. In this situation they have fallen into the hands of the present possessors, who yet, in a great degree, remain ignorant of the remedies to be applied for their renovation. Happily for them, however, if they avail themselves of it, the necessary information is in the most ample manner afforded them in the writings of Agricola; to him the Province is deeply indebted. He has, in the most pleasing and impressive style, given them important lessons from week to week; and they in return, have endeavored to prove themselves not unworthy of his instructions. It is REALLY TRUE, my Lord, that the inhabitants of this country are now generally awakened from that state of inaction and inattention to their best interests in which they have so long remained; and we have every reason to believe that a material change is taking place in the habits and views of farmers from one end of the country to the other: they have not only been taught to think, but to act: different modes of cultivation from those formerly practiced are now pursued, and agricultural societies are established in every county and district in the Province. But my Lord, the exertions of the country, unaided by the powerful influence of the capital, and the assistance of the Legislature, will be in vain. They all, with the most anxious expectation, look up to the seat of government, as to the centre of the wealth of the country, for countenance and assistance. The formation, therefore, of a Central Agricultural Board in the capital, is of the first importance—to give permanence to the other societies—to uphold their spirit, and to guide their exertions. The funds of this Board should not be limited exclusively to the district of Halifax, but should extend to the Province at large; here information may be collected from our own experiments, and from the experience and discoveries of other countries, and communicated to all quarters. But it would be too tedious to relate, had he the ability, all the advantages to be derived from such an institution. The introducing improved implements of husbandry, and seeds suited to the climate, and the assisting valuable settlers who land here, in procuring employment, by the connection of this Board with the county societies, claim to be ranked among its first duties. But as the formation of this Board may justly be considered as a provincial concern, he did not mean to propose that the present meeting, however competent to the task, should frame its constitution; that should, in his opinion, be left to the Assembly; and we may reasonably hope they will grant liberal aid, which, with private subscriptions, will form a fund that will enable this society to perform what he had

in part stated, and direct the enterprise and emulation of farmers, by judicious premiums, into that course of Agriculture most conducive to our prosperity. Having said so much on a subject almost new to him, but one in which he felt the warmest interest, he begged leave to propose, with His Lordship's permission, several resolutions, which, if agreed to, he said would form the basis of an application to the Legislature for a legal constitution. For the first four, he owned he was indebted to the unknown Agricola, who had kindly submitted to the Solicitor-General and himself, his views on the subject; and he presented them to the meeting for their approbation; or to alter them in any other shape they might think most conducive to the object in view.

1st.—Resolved, That it is the sense of this meeting, that a society to be called ————————, shall be instituted in Halifax; that it shall consist of ordinary and honorary members; and shall be regulated by a President, Vice-President, Treasurer and Secretary, with a committee of twenty Directors—five of whom shall go out every year by seniority, and other five members to be chosen in their room; that these officers shall be elected annually, with the exception of His Excellency the Right Honourable the Earl of Dalhousie, who is declared permanent President during his administration, as the founder and promoter of this institution; that these offices shall be all honorary, and discharged without pecuniary compensation, except those of the Secretary and Treasurer, to whom salaries or other allowance should be given; that the Governor and Council, and members of the House of Assembly shall be members EX OFFICIIS; and that this society shall have two or more stated meetings annually—one of them always taking place during the session of Assembly.

2nd.—Resolved, That the funds of the society arising from whatever source, shall be appropriated exclusively to the agricultural improvement of the Province; that they shall be placed under the care of the Directors, or a quorum of them, to whose inspection the Treasurer's books shall always be open; that an annual scheme of accounts shall be prepared prior to the stated meeting in March, which shall be examined in a special committee appointed for the purpose—half of which shall always consist of members of the Assembly; and that the principal appropriation of the funds shall also be voted and determined in said meeting while the Legislature is in session.

3rd.—Resolved, That the objects of the society shall be to cherish, direct and watch over the agricultural interests of the whole Province; to collect all important information on the subject, and to circulate the same by the publication of at least one volume annually; to enter into, and support, a foreign correspondence, that we may benefit ourselves by the experience and discoveries of other countries; to direct the enterprise nnd emulation of the farmer into the channels most conducive to our prosperity, by offering premiums, by introducing new machinery, seeds and live stock; and lastly to assist the emigrants who may land

here in obtaining situations and employment, or to send them into the country under the care of the different county societies.

4th.—Resolved, That a committee shall be appointed to apply for a legal constitution to the Society from the Provincial Legislature, and for an annual grant in aid of its funds, with such other privileges as the House may see proper to confer; and to take all necessary measures in order to accomplish the purposes of this meeting.

5th.—Resolved, that it is the opinion of this meeting that a subscription should be immediately opened for all such persons as intend to become members of the Central Board, and that the sum of one pound be subscribed by each member for the coming year, to be paid to the Treasurer of the Board, for the purposes mentioned in the foregoing resolutions, after the same shall be established, and such officer authorized to receive the sums subscribed.

The resolutions being severally put and unanimously agreed to, the Solicitor General rose and expressed a wish that the Honourable the Chief Justice would be pleased to accept the office of Vice-President of the Society.

His Excellency expressed himself gratified with the nomination, and assured the Chief Justice during his administration he should have as little trouble as possible.

The Honourable Chief Justice, in reply, declared his sense of the honour done him, and observed the Society had his whole heart, and that whenever he could be useful, his abilities should be exerted to promote its success.

His Excellency then observed that the next appointment being that of Secretary, it was an office important to the success of the whole plan. In an agricultural society such a person ought to possess qualifications adopted to that particular subject. It appeared to him there was one person extremely capable of the office, and that was Agricola himself. His Lordship again assured the meeting that he was totally unknown to him, and he did not wish that the prying eye of public curiosity should endeavor to discover him, but to leave that matter to himself until he judged of the opportunity most seasonable to come forward. To the Honourable Judge Haliburton, His Lordship expressed, he was much indebted for his willingness to officiate in Agricola's place, in the mean time. This information was gratifying to the meeting, and noted with strong expressions of applause.

Judge Haliburton here rose and observed, that in accepting that office he knew he was not competent to its duties, as he was, in a great measure, ignorant of farming. It was true, that almost nobody could read the luminous and instructive letters of Agricola on that subject without catching the general outline; but he acknowledged himself unacquainted with the details; and he therefore accepted the office in trust for Agricola, and would most cheerfully resign it into his hands whenever he deemed it prudent to disclose himself.

The Honourable Judge Stewart could not refrain from offering a few remarks on the pleasing and gratifying sight of so many gentlemen

coming forward to struggle for the interest of the Province, and to revive that agricultural society which had formerly been established, but no sooner formed, than it vanished in smoke. He was confident it would not be the case with this. He recollected the country when it was insignificant as to talent, capital, and energy. There were some at that early period, it was true, who possessed these advantages, but they were few. Now we have a great many in our population, enlightened, opulent, and full of activity and zeal. This, he observed, was a country replete with natural resources and inhabited by a hardy peasantry of great quickness and sagacity. These peasants are shewing us by their conduct, that the letters of Agricola are not thrown away upon them: the plough has recently been going at a rate it never went before, and land has been broken up this Fall which has rested for years. It was not, he observed, talk and eloquence that should occupy them this day—it was deeds and facts. They wanted to obtain those means by which to keep in motion the growing enterprize of the country—it was money that was necessary to that object—without it they could do nothing—but possessed of funds this Society should could exercise a wholesome vigilance and control over the others which had sprung up on all hands; and this control was a circumstance which formed one of the most essential and important parts of their duty.

Lawrence Hartshorne, Sr., Esquire, observed to His Lordship, that he had in his hands £15 or £20 of the funds of the old Agricultural Society, which he would, with the sincerest pleasure, pay over to the treasurer, appointed to the proposed institution.

The Honourable Judge Haliburton remarked that the society which the Honourable Judge Stewart had alluded to, was formed under far different prospects than what now presented themselves; this country was then a wilderness and without roads; we have now a hardy and extensive population, well acquainted with the soil and climate—the peasants require only instruction. It is remarkable, however to observe the effect of prejudice upon the minds of some individuals, for after all the conviction the letters of Agricola have afforded, there were some who still adhered to the old idea that we cannot rear bread corn, and that the country is only adapted to pasturage. Let any man look out of those windows and behold the ground covered with snow, which generally continues four months, and call this, if he will, a grazing country. The poor cattle, before the opening of Spring, are standing lean and starved in their stalls, having eaten up the produce of the summer. Agricola has said that where there are no natural obstructions to the plough, the country was fit to raise grain; and he was satisfied that this Province was abundantly capable of supporting its population. As to the observation of his learned friend, that he hoped the meeting would not vanish in smoke, he should say, for his part, that he hoped it would, for he wished to see it end in SMOKE; but it was the smoke of the settler's hut and of the compost dunghill. He hoped that from the exertions of THIS Society, this

smoke would rise curling above the forest from one end of the Province to the other, and that the emigrant would never be at a loss to find employment, and obtain for his family a decent and comfortable support.

The Reverend Dr. Inglis observed that there was a material difference between the society that formerly failed and the present one about to be established. The former had no adequate support, whereas this, from the appearance of the meeting, and from his Lordship's countenance, certainly would obtain and command encouragement.

A discussion next took place about the propriety of fixing the amount of the subscription to entitle individuals to become members of the Central Society; and it was ultimately determined that 20s. should be inserted, leaving it in the option of every one to add what donation his own liberality might suggest.

His Lordship then noticed, that it had been left to him to name the Society. He conceived there was no necessity to go out of the way to find a name, and he thought therefore it should be called "The Provincial Agricultural Society."

The following gentlemen were then appointed a Committee of Management:—Honourable Judge Haliburton, Hon. T. N. Jeffery, S. B. Robie, Esq.; S. G. W. Archibald, Esq.; H. H. Cogswell, Esq.

Directors:—Hon. M. Wallace, Hon. B. Haliburton, Hon. James Stewart, S. B. Robie, Esq.; S. G. W. Archibald, Esq.; Wm. Lawson, Esq.; H. H. Cogswell, Esq.; Rev. Dr. Inglis, Rev. B. G. Gray, L. Hartshorne, Esq.; R. Fairbanks, Esq.; Peter McNab, Esq.; John Pryor, Esq.; John Prescott, Esq.; Samuel Albro, Esq.; Thomas Boggs, Esq.; M. Richardson, Esq.; Wm. Pryor, Esq.; John Stayner, Esq.; S. Lydiard. Esq.

A subscription was afterwards opened by the noble Chairman, when upwards of £350 in donations were subscribed—and 120 gentlemen joined the Society. His Lordship's donation was 100 guineas.

His Lordship then retired from the hall amid the cheers and grateful plaudits of one of the most numerous and respectable public meetings ever held in this town; and the Honourable Chief Justice took the chair—when the thanks of the Society were unanimously voted to His Excellency.

LETTER 23.

ON MANURES.

WHEN a country advances, in the progress of improvement, from pasturage to tillage, the various sources of manure are investigated and sought after with an avidity commensurate to the fervent spirit of enterprise. The attention, which is paid to this branch of management, indicates with certainty the state of the art; and wherever we discover little or no exertions made in it, in order to accumulate by artificial means the aggregate heap beyond the ordinary supply, no further proof is requisite of the state of debasement in which Agriculture lies. On the other hand, when a vigilant and presevering industry is ever on the alert; when numerous expedients are tried to enlarge the quantity as well as to improve the quality of manures; when composts—diversified both in the ingredients and proportions—become objects of curiosity and experiment, these are the first symptoms of returning life and vigour and may be hailed as the precursors of more flattering and auspicious prospects. The ardour of agricultural pursuit in England was ushered in by these beginnings; and at the present day, there is no subject of more paramount interest than the augmentation of the dunghill. Every kingdom of nature has been ransacked to find out substances endowed with the principle of fertility; science has come in to the assistance of art; philosophy has stooped from her dignity, and joined in the general research; and the public interest, instead of having flagged with the very ample success which hitherto has attended the inquiry, has only been roused to more spirited and adventurous efforts. The COMPOST MIDDENS of Lord Meadowbank, the mixture of soil with decomposible matter, the universal application of lime, and the late introduction of burnt clay, are steps in that great race, in which all men, as if stimulated by one common impulse seem to have engaged. Indeed, unless other means are resorted to, in order to replenish the waste of vegetation, than the simple contents of the barnyard, Great Britain could not sustain the half of her population, nor draw from her own territorial domains that exhaustless abundance which provides materials for her commerce, and ministers to the necessities, comforts and luxuries of life. This exuberance of supply may all be traced to the improved and skilful methods, not of cultivation, so much as of multiplying the efficacy of putrescible manures. There was a period in her history when, like this Province, she was more "a grazing than a corn country;" and when butcher meat bore no sort of relation in price to wheat and other grain. When we review this part of her history, we are struck with the palpable blunders she once committed, and trace, between them and our own, a striking and remarkable analogy. The manures then in use were the simple excrementitious matter of the cattle on the farm, unaided by those compound ingredients which have

been since introduced, and which may be considered in the light of the raw materials from which the modern stores are manufactured. In truth, without great attention to the artificial increase of this necessary article, our Agriculture can never rise to any importance; and it would be vain to urge the extended culture of white crops, unless we possess the means of repairing the exhaustion of the soil. It has been long acted on in Flanders, and is now universally acknowledged in England, that an arable farm may be kept in good heart, and subjected to a continued course of cropping, without any extraneous dung, other than what is made on the premises from the consumption of green crops, straw and fodder. The cattle which are fed on turnips, the horses employed in labour, the pigs and poultry are perfectly sufficient to supply such a quantity, under the direction of a scientific manager, as will annually restore to the land that richness of which it is deprived; and at the same time, admit the grain to be carried to market, to meet the wants of the community. Every spot, in both countries, can be made to repair its own waste; and the luxuriance of one is never employed to correct the poverty of another. Here our rich marshes and intervals are taxed, and as it were, laid under contribution for the benefit and support of our uplands.

In the further prosecution of this subject, I shall point out some capital errors in the management of manure, which prevail, with few exceptions, throughout the whole Province, and which have a most pernicious influence on our agricultural progression: and I shall prescribe the remedies which the case suggests, and which are practicable under existing circumstances.

I observe in the first place, that we have almost no pits dug upon a regular plan for the collection and preservation of the dung, which from time to time is wheeled out of the barn. Sometimes it is spread out on the green sward; sometimes cast carelessly in a court, or adjoining yard; but seldom in an excavation made purposely for retaining the juices which run from it. These are suffered either to stream along the surface, or sink into the earth; and in both cases, their utility is sacrificed to inattention and ignorance. This is no more, however, than the half of the evil. The exhalations, which arise from the ardent influence of a Summer's sun, and from the natural activity of fermentation are permitted to escape freely, and to carry along with them all the strength and substance of the putrescible matter. No means are taken to fix the gases which are generated, and which constitute the elements of vegetable food. I do not know, if there be one solitary instance throughout the wide range of the Province, of the application of soil on the surface of a dunghill, to prevent this unpardonable waste and dissipation; and I am too confident, there is none, of lining the bottom with a regular coat or layer, to imbibe the nutritive moisture. The dung, too, is suffered to rot without any attention whatever to the degree of heat; and I should startle my readers, were I to tell them that the fermentation should never be urged beyond 100 degrees of Fahrenheit's Thermometer. At a much lower heat, carbonic acid, carburetted

hydrogene, and the other gases of that family ascend as elastic fluids, and are diffused and lost in the atmosphere. The dunghill becomes what is called FIRE-FANGED, and the principles of fertility are expelled by the action of those chemical laws, which regulate and pervade the minute and subtle particles of matter.

If the dung be injudiciously treated, the urine discharged by the cattle is squandered, and indeed altogether lost. This is owing to the construction of the barns which generally prevail throughout the Province, and which cannot be altered without some little outlay of capital. Being formed of wood, they are mostly raised and propped on a foundation: and a floor of plank is invariably laid. The whole urine of the cattle, except what is absorbed by the dung, finds its way through the seams; and either oozes into the earth, or forms beneath the barn a fetid and noisome pool of standing water. The essential elements of vegetable matter with which it is surcharged, assume quickly the gaseous forms; and either mount up through the floor, or escape by the sides of the building. At all events, their fertilizing qualities are turned to no account, and the loss, from this single circumstance, is ruinous beyond calculation. It may be necessary, in some measure, to ascertain the amount of this mischief, that we may set about correcting an evil of such formidable magnitude, with a vigorous and resolute energy. I should be afraid to hazard my character with the public, by stating in round and unqualified language, the value of this rich juice which is literally wasted, and thrown away: and, therefore, I shall proceed with caution, and give a detail of facts—conclusive in their bearings—and substantiated by the best authority. They are contained in a *letter from Charles Alexander, near Peebles, in Scotland, and are addressed to Sir John Sinclair, in 1812, for publication. This intelligent farmer had long been impressed with the great importance of the urine of cattle as a manure; and he set about to discover, by a long and well conducted series of experiments, the best method of collecting and applying it. He began by digging a pit contiguous to the feeding stall, but distinct altogether from that which was appropriated for the reception of the dung. The dimensions of this pit, according to his own account, were 36 feet square, and 4 feet deep, surrounded on all sides by a wall, and the solid contents were 192 yards. Having selected the nearest spot where he could find loamy earth, and this he always took from the surface of some field under cultivation, he proceeded to fill it; and found that, with three men and two horses, he could easily accomplish 28 cubic yards per day; and the whole expense of transporting the earth did not exceed 41. 16s. When the work was complete, he levelled the surface of the heap in a line with the mouth of the sewer, which conducted the urine from the interior of the building, on purpose that it might be distributed with regularity, and might saturate the whole from top to bottom. The quantity conveyed to it he estimates at about 800 gallons; but as this

*Farmer's Magazine, vol. 13, page 78.

calculation was founded partly on conjecture, for he measured not the liquor, it will be better and more instructive to furnish and proceed on DATA, that are certain and incontrovertible. The urine was supplied by fourteen cattle, weighing about thirty-four stone each, and kept there for five months on fodder and turnips. The contents of the pit produced 288 loads, allowing two cubic yards to be taken out in three carts, and he spread forty of these on each acre; so that this urine in five months, and from fourteen cattle, produced a compost sufficient for the fertilization of seven acres of land. He states further, that he had tried this experiment for ten years, and had indiscriminately used in the same field either the rotted cow dung, or the saturated earth; and in all the stages of the crop, he had never been able to discover any perceptible difference. But what is still more wonderful, he found that his compost lasted in its effects as many years as his best putrescent manure, and he therefore boldly avers that a load of each is of equivalent value. Conclusions of vast importance are deducible from this statement; and I cannot resist the feeling of placing them in a strong and advantageous light. They speak a volume of instruction; and if we are willing to learn they must lead to a very material alteration in the construction of our barns. It appears, then, that in five months, each cow discharges urine which, when absorbed by loam, furnishes manure of the richest quality, and most durable effects, for half an acre of ground. The dung pit, which contained all the excrementitious matter of the 14 cattle, as well as the litter employed in bedding them, and which was kept separate for the purpose of the experiment, only furnished during the same period 240 loads, and these, at the same rate, could only manure six acres. The aggregate value of the urine therefore, when compared with that of the dung, was in the ratio of 7 to 6; so that we are borne out by these premises in this extraordinary inference, that the putrescible liquor which in this Province, and under the management of our farmers, is wasted and annihilated as far as regards any useful purpose, is intrinsically worth more than the dung as an efficacious and permanent dressing; and if we take into consideration that this latter manure is not treated with any skill and judgment, it will not seem surprising that the culture of white crops has never been carried here to any extent, since we have despised and neglected the only means of creating them.

These defects call aloud for amendment. No country is entitled to be styled Agricultural where the fundamental maxims of the science are so outrageously violated, and where the prevailing practices set at nought the simplest rules of the art. Grazing draws forth no energies of the mind; it is compatible with indolence, stupidity, and a gross ignorance of all principle; the Arab in the desert can tend his flocks and herds, and leave their multiplication to the instinctive appetites of nature; it is only the first step from the savage life, and in place of hunting for the prey which he devours, man tames and domesticates the lower animals, but leaves their increase, their subsistence, their diseases, to the unguided agency of natural causes. 'Tis the plough

which awakes his dormant faculties and stimulates to industry. Like the Sovereign of the Creation, he commands, and is obeyed; he speaks, and it is done. The weeds, which are the natural inmates of the soil, disappear at his bidding; the grasses spring up, and form a carpet for his feet; the corns are subjected to his power, and wave their loaded ears around his dwelling; the forest gives up its fruit trees to load his table with their luscious products; and the features of a rugged and forbidding territory are transmuted to the beautiful and sublime, and soften under the influence of his transforming smile. This Province is still in a rude and unsubdued state; and its husbandry partakes of its general character. For this, it is not difficult to account. Emigrants of all trades, of all habits, and of all ranks of society, land on this foreign strand in quest of subsistence. Manufactures are the offspring of civilization, and of the accumulation of wealth; and cannot find their way but into an old country, abounding with resources and population. Here we have none, and cannot have them for a century. The unfortunate stranger, driven from the only stay on which his hope rested, seeks refuge from despair by plunging into the forest, and cultivating the soil to answer the cravings of indignant nature. Without skill, without capital, without the benefit of instruction, he becomes a self-taught farmer, ready to run into every blunder which ignorance has invented, and to which the vicious culture of the country has lent the sanction of authority. His hut, his barn, his implements of husbandry, his seed, his stock, are all chosen without knowledge, and continued in use without the least exercise of the understanding. He has no landlord to exact a rent; no government to levy taxes; no rival to animate industry. He soon rises above want; the spontaneous productions of the soil yield him a scanty subsistence; the luxuries of life are seen only at a dim and indistinct distance; and his faculties, thus lulled asleep by surrounding circumstances, fall into a state of torpid lethargy. He must be stirred up; aroused, and forced into action. This is the province of superior and exalted characters, who, from their elevated rank in society, preside over his destiny. To them a rich reward of gratitude is due; and their memory shall descend to posterity, embalmed by the blessings of a present generation. We are approaching an eventful epoch; the public attention is excited; we are prepared to count over the catalogue of our past errors; we are panting after knowledge; and a new age—full of promise and pregnant with improvement—is arising on our desolate and forlorn prospects.

During this state of public feeling, the evils, which I have pointed out in our treatment of decomposable manures, cannot long remain without correction. The remedies are not only simple, but accessible to every farmer of moderate capital; and the whole expense of the improvement will be compensated by the first, or at most, the second year's saving.

1st. With respect to the formation of a dung pit, I would recommend that a place be chosen near the barn, which should be dug

about three feet deep, and of a size proportionate to the stock of cattle usually kept by the farmer. It is not necessary that it should be built round with a wall, or have a perpendicular descent, as it may slope gently inwards, and deepen gradually towards the centre. After it is thus hollowed out, the texture of the bottom should be examined, and if found firm, impervious, and capable of containing the juices, no further trouble is requisite, and the work is complete; but, if open and porous, it should be coated with clay, and lined with large and coarse flags. Into this pit, earth from some neighboring field should be first brought, and strewed over the bottom and sloping sides, to the thickness of from nine to twelve inches. Thus a safe depository will be prepared, for the cleanings of the barn; for waste straw and weeds; for the sweepings of the kitchen; for the stems of peas, beans, cabbages, potatoes, and in short, all vegetable matter of woody fibre, as well as for the dung of the feeding cattle. After a complete layer of putrescible matter has been spread all over, and when the symptoms of an active fermentation have become visible, the earth, which was thrown out of the excavation, may be slowly returned, and scattered on the surface of the heap, to catch the exhalations which are ascending. Hither, too, the urine should either be conducted by a drain, or carried by buckets; for it is an unpardonable waste to lose the benefit of this rich and invigorating manure. The earth which lies at the bottom will greedily drink up the urine and the vegetable juices, and thus gain a large accession of nutriment and value. So soon as the pit is filled up in the manner herein described, it should be emptied of all its contents, and these should be carted to the field where they are meant to be afterwards applied, and there laid down in some convenient corner, to be mixed up and sorted into a profitable compost. The pit—adjoining the barn—may be again lined with mould, and the former operations repeated in procuring and augmenting its contents.

According to this plan, every farmer, at the first opening of next Spring, should cart out his dung, and form it at once into a composite pile, which, if skilfully managed, will gather heat, and undergo the process of fermentation before it will be needed in seed time. He should then instantly set about the digging of his pit, and the other alterations on the barn, which are indispensable to the successful collection and preservation of his future manure. During summer, this pit should be emptied twice or thrice according to circumstances; and its fermentable and earthy materials transported to the ground which they are destined to fertilize, and there subjected to a new process. Towards the Fall, which by its length and mildness makes amends for the advantages of more favoured regions, all those compost heaps, as well as the dung about the barnyard, should be spread on the land, which is meant to be immediately ploughed. In the meanwhile, an additional stratum of mould should be distributed along the bottom and sides of the pit before the approach of winter, and during that rigid season the dung may be accumulated without any extraordinary care, as the intensity of the cold is unfavorable to putrefaction, and

little loss will be sustained from the dissipation of the gaseous matter. Such farmers as may choose to take the trouble, and have suitable convenience of covered sheds, may pile up beforehand a quantity of dry earth, which may be scattered over the dunghill in the depth of winter, on such places as indicate a strong fermentation.

2nd. These remarks and general reasonings will have prepared my readers for the sentiments I must express regarding the construction of our barn floors. They are the objects of my unqualified condemnation as an agriculturist, of my sincere regret as a friend of the country, and of bitter and deep bewailing as the anxious promoter of our future and rapid advancement. Reform here cannot be effected without considerable cost; and I anticipate an obstinate adherence to existing errors, notwithstanding the soundness of the conclusions, and the manifest utility of a change. I must, however, cling to the hope of receiving at least a limited and partial obedience; and I request my wellwishers, who have animated me in my course, and borne up my spirits in the midst of difficulties, to listen to the call, and set the first yielding example. The increase of valuable manure will be incalculably great; and the solid benefits will vastly outweigh the trouble and expense. I see only one plan by which this evil may be effectually obviated; but as there is a choice in the materials to be employed, such may be selected as are most accessible in any particular district. After tearing up the planks, and building the foundation round and round close to the sills, the void space below the flooring should then be filled and packed firm with earth. As there will be a necessity to cut away all the present sleepers or joists, which, besides supporting the planks, bind and unite the two sides of the frame, pieces of square timber may be stretched across the whole breadth and at a lower depth, and be secured to the bottom of the sills, either by a mortise, or by driving down a round iron bolt. By this means the strength of the frame will be preserved unimpaired; and the operations may proceed without endangering the structure. The earth should then be filled in, till it rises to the level of the present floor, and it should be beaten down by a heavy mallet, till it is completely consolidated. A stratum of clay should next be laid over the whole surface, by which the moisture may be retained and hindered from escaping through the earth. After dividing the interior into its respective compartments, the arrangements must proceed according to the use for which each part is designed. The stalls for the horses and cattle claim a distinguished share of attention. The fore feet of the animal should stand on higher ground than the hind, and there should be in every stall a gradual declivity backward, terminating in a gutter, in order to carry off all liquid matter. To this gutter an easy descent should be given outward, that all the urine may flow towards the pit on the outside of the building, which I have described as the great reservoir of this putrescible stream. The floor of each separate stall, as well as the gutter, may be laid with plank while the clay is soft and yielding, and every seam and interstice may be closed up by the same

substance. These planks—thus pressed and imbedded in the clay—may be nailed and secured to transverse beams running along the length of the barn, and so adjusted as to preserve a sloping direction in the feeding stalls and gutter. But in every case where stones are within the reach of the farmer, they are decidedly superior in firmness, durability and usefulness; and paving the floor with them, although perhaps a little more expensive in the first instance, will, in the end, much better answer his expectations. The stalls should be laid with them exactly in the manner in which Water Street here has been lately improved; and the gutter may be formed either of similar materials, or preferably of smooth flag-stones, like those forming our foot pavements.

The adoption of these improvements in the disposition of our barns will give a mighty impulse to Agriculture; the urine and vegetable juices, which are now lost and dissipated, would multiply the powers of fertility; and the extended cultivation of white crops from the wonderful increase of putrescent manure, would be propelled with a celerity proportioned to the ardent hopes of the country.

TO CORRESPONDENTS.

I cannot do justice to the many valuable communications this week has brought forth. I have received no less than four original papers, bearing a direct reference to the objects of my inquiry, and abounding with curious and convincing processes of argument, which must all be postponed; and in selecting for publication "the statistical account of Cumberland," I was guided, not by its superior claims, for two of the essays withheld from the press have equally intrinsic merit.

I have to acknowledge letters from all parts of the country: from Onslow, from Truro, from Pictou, from Windsor, from Horton, besides three or four in town; and I beg to assure these several writers that their various suggestions shall not be lost, although it is impossible to tax my publisher with such a load of matter. Hitherto he has introduced into the columns of the RECORDER, not only my regular series of letters, but all the other miscellaneous intelligence, without pecuniary compensation; and the public must be satisfied that he has often sacrificed his immediate interest, to leave room for these agricultural communications. I have also to state that he has gratuitously conducted my private correspondence; and amid the present tumultuous and indecent search after Agricola, he has repressed all idle curiosity, and shown no disposition to hunt me out of retirement. He neither knows, nor has attempted to know me. If I have been fortunate in procuring any friends, and if my labours have been acceptable, I request them to show their gratitude in the encouragement of his paper.

I must again caution my readers against all inquiries about myself, which have risen to an unprecedented height since the late public

meetings. In every circle my ears are stunned with foolish speculations; the books sent me have been traced and watched; my handwriting has been subjected to every species of torture and examination. I have even been compelled to steal from the notice of my acquaintance the hours necessary for the hurried composition of these letters, and like the old woman in the fable, the public seem determined to know the mystery of the eggs, although the experiment should tear the hen in pieces. I am now encompassed with so many snares; such a number of people are engaged in tracing and marking my motions, that it will be impossible much longer to fulfil my public engagements, and I shall be obliged either to disclose myself and cease writing, or to drop at once all further correspondence, and retreat into obscurity. No REAL character, although possessed of the most estimable qualities, durst daily present himself to the public eye, and range over such a varied field of discussion, unless he were callous to wrangling, strife, personal abuse, invidious allusion and endless invective—the sure concomitants of any living writer in a small community, that affects distinction. My fictitious name is the shield under which I repose in safety.

TO AGRICOLA.

SIR,—In attempting to delineate the topographical situation of a country, [the partial representation of any particular district cannot by any means be a true picture of the whole] and a country too varying as much in regard to soil as any other perhaps in the Province, I shall endeavor, in this communication, to make some brief observations on the different divisions—regarding the present state of agricultural improvement.

The County of Cumberland is situated at the northern extremity of the Province: bounded on the north by the line of New Brunswick; on the west by the Bay of Fundy and part of King's County; on the south by the district of Colchester; and on the east by the great Gulf of Saint Lawrence. It may be said to be divided into seven distinct districts or townships, viz.: Amherst, Fort Lawrence, Menuda and River Hebert, Rivers Maccan and Nappan, River Philip, Remsheg and Westchester.

Amherst.—which contains the county town, although very little elevated above the level of the sea, yet from its bleak and northwest aspect, is considerably exposed to the chilling blasts from that quarter during the winter months. The farmers here do not pay that due regard or strict attention to agricultural pursuits which the importance of the subject commands; depending chiefly on their hay and pasturage, which enables them to rear and keep large stocks of cattle, sheep, etc. The marshes, although completely dyked, and in many parts tolerably drained, lie almost in one boundless tract of uncultivated soil, comprising some hundreds of acres, unmarked by the furrow of the plough;

and are capable of being improved to infinite advantage. Those parts, which have been judiciously drained, and are become dry, are generally appropriated to English hay, as it is called, or to grazing, and are most admirably calculated for the reception of the plough; and with good management would teem with bread corn in vast abundance. The uplands, in their primitive state, are not, perhaps, so rich as in some other parts of the county, but are in general capable of being highly improved, by a regular mode of culture. Besides the vast heaps of animal dung produced from the barns, which accumulates during the winter to a prodigious size, the immense and endless quantities of marsh mud even at the very skirts of the uplands, are acquisitions, which few farmers in this Province can boast of; and lime, too, is evidently within their reach: yet strange to say, I know of only one solitary instance in which that valuable fossil has been used as a manure. Possessed of all those local advantages, I wonder not at the remark made by your "respectable Onslow correspondent," after his tour through part of this county, that Cumberland ought "to be the granary of Nova Scotia." I think the observation was well applied, for I know of no county in the Province that holds out greater encouragement to begin and perfect the most approved systems of Agriculture.

Fort Lawrence.—As the same remarks will generally apply, the soil and situation being nearly the same as those already noticed, it would only be a repetition of words to enter into detail on this township, as its picture has been already delineated. Suffice it to say, that the uplands are more moist, and a little more inclined to clay, but equally productive and good in quality; and yet in several acres of excellent land, from which all natural obstructions have been long ago removed, the cradle hills are still perfectly manifest, even in the very heart of the settlement, and produce nothing but a coarse contaminated herbage. Some may, perhaps, gravely assert that these will never be corn and bread districts; but I boldly and fearlessly contend that under a regular, attentive and judicious course of husbandry, they will yield an ample supply for the inhabitants, without subjecting the poorer sort to eat common coarse bread, as a reward for their honest labours.

Menuda and River Hebert.—The former of these is chiefly settled by Acadian French, who follow a mode of culture peculiar to themselves; and their prejudices are so deeply rooted in that respect that very little hope can be entertained of their conversion to a new system. Some years ago these Acadians raised large quantities of wheat on their marshes, more than sufficient for their own consumption; but from some cause, of which I am unacquainted, they have now totally abandoned the practice. The uplands are fine rich loam, and remarkably productive.

River Hebert, including Barronsfield and Franklin Manor.—Comprises large bodies of marsh, some partially diked, others still exposed to the ravages of the tides. The uplands chiefly consist of a

strong rich loam. Some of the farmers here are remarked for raising abundant quantities of potatoes, and plentiful crops of wheat on the uplands, more perhaps from the richness of the soil, than from any particular mode of culture.

Rivers Maccan and Nappan.—In addition to large bodies of marsh, of a good quality and well secured, these settlements comprehend a considerable portion of rich interval; and there is no part of this country that can boast of more practical farmers, or manifests a better system of husbandry. They consist principally of farmers from Old England, and their descendants. They not only raise a full competency for domestic consumption, but supply many of the distant districts, annually, with seed, wheat, etc. The uplands incline to rich loam, and are remarkably fertile.

River Philip.—This may be properly styled an infant settlement, not having been inhabited more than thirty-two years. Considerable progress was made during the first part of that time, in clearing and improving the land; but of late, many of the farmers have greatly relaxed from their former exertions, and are pursuing other objects, with a view, as they allege, of present advantage; but which, I assure them, will be ultimately much less profitable, than a due regard to the cultivation and improvement of their farms. This district contains large portions of rich interval, well adapted to the drill and turnip husbandry; together with valuable uplands of easy culture, which are rarely managed to the best advantage. The seasons, too, are much earlier than in many other parts of the county, and the soil and situation are peculiarly gifted by nature for the culture of bread corn; yet strange to say, some of our farmers do not raise an adequate supply for their own households.

Remsheg.—This is an extensive district; but its progress in agricultural improvements has hitherto been very slow, as well as injudicious. Very few of what may be called practical farmers are to be found amongst them, and they have as yet but manifested a rude specimen of that great branch of national industry. The marshes here are pretty extensive; are unreclaimed; are of a light spungy nature, and cannot hold a comparison with those in the other parts of the county. The intervals, considering the extent of the township, are rather circumscribed, yet in general are of a good quality. The uplands are a little moist, and inclined to clay rather than loam; but are well adapted for wheat culture. Yet it is painful to remark, that many acres of this valuable land remain unsubdued, even at the very threshold of the settlement; these people, too, pursue other objects, like those above noticed, in direct contradiction to their agricultural interests.

West Chester.—This division comprises part of those high lands, commonly called, or known by the name of Cobequid Mountains; and is much higher elevated above the level of the sea than any part of the county, yet it is well inhabited. Notwithstanding the height, in most seasons all white as well as green crops are brought to perfection,

and produce far beyond what could be expected from the appearance of the soil. The inhabitants are chiefly what are termed refugees, and settled here between thirty and forty years ago; and they have manifested evident marks of perseverance and industry, on this unlucky and sterile spot.

Cumberland is evidently destined by nature to become a great bread county; for independently of all local advantages already noticed, there are others not less valuable. It is intersected with numerous bays, rivers and creeks, which produce ample supplies of various and valuable manure; and besides, limestone is obtainable at Maccan and Nappan, in the vicinity of Amherst, and at River Philip; and no doubt, will be discovered in many other places, when the earth is released from her ancient and umbrageous tenants. Nothing is wanting but the persevering hand of industry, and the adoption of a more approved and better system of agriculture; and then, and not till then, will the yellow harvest wave luxuriantly throughout our plains.

I am, Sir, with due regard, yours most truly,

River Philip, Dec. 16, 1818. STEPHEN OXLEY.

REMARKS.

This letter may be called a brief statistical account of Cumberland, and must be highly interesting to the whole Province. It is written to do away the impression of any natural incapability either in the soil or climate, for the production of white crops; and I rejoice that the opinion, which I broached in a very early stage of my course, seems to be daily gaining strength and confirmation. So indignant are my correspondents at some late attempts to revive this old exploded doctrine, that in three of my letters this week, allusions are made to the subject; and I have even an assurance from the secretary of one of the county societies, that at their first meeting, a solemn appeal will be entered against it in the name of the whole body, and that a public instrument will be sent me to signify their united conviction: "that Nova Scotia, so long degraded and abused, is abundantly capable of perfecting all sorts of bread corn." If white and green crops come to perfection in the Cobequid Mountains, the valleys and plains must, under proper management, and barring the usual changes incidental to all countries, yield a forward and certain harvest. I again assert, and I fear no contradiction, "that there is no county within our territorial boundary, where wheat, rye, barley and oats will not in nineteen seasons out of twenty, ripen and perfect their seeds;" and I feel obliged to Mr. Oxley, the vice-president of the Cumberland Society, for coming thus boldly forward, and giving his sentiments and name to the public. In truth, all the exertions which have been lately made: all the associations which have been formed; the unexampled spirit

and liberality of the capital in this great cause, are the vain and idle dreams of enthusiasm, if nature has doomed the country to pasturage, and cursed it with sterility. The Provincial Society, now in operation, and which embraces whatever is distinguished for rank, talent and respectability, will soon put this question to the test of experiment; and if their patriotism be backed by a corresponding zeal in the Legislature, this Province will assume a proud and independent attitude, and plant her glory on the pedestal of the PLOUGH. There is public virtue in the very trial; and every man will bewail as a calamity the miscarriage of their plans.

No. 24.

ON MANURES.

THERE has been no point perhaps in Agricultural science more keenly contested than the exact degree of fermentation to which dung should be exposed, before it be spread on the soil. Some argue that it should be allowed to rot till its original texture be broken down and destroyed; others, that the process should be carried a considerable length, but checked about the middle of its course; while a third class allege that the least incipient state of putrefaction is at the expense of the vegetable gases, and should, as much as possible, be prevented, till the manure be deposited in the earth. Amidst such a contrariety of warring and discordant opinions, and these too supported by naturalists distinguished for the extent and importance of their discoveries, some portion of doubt must adhere to whatever determination we adopt. Sir H. Davy*—a name of preeminent celebrity—contends that the smallest degree of fermentation is accompanied with setting at liberty the elementary principles, which will naturally escape, unless their disengagement be effected in the bosom of the soil—in which case they will be imbibed and kept in reserve for the purposes of vegetation. He thinks, therefore, that straw, in place of being put in the dung yard, should be ploughed down in a fresh state, and that to facilitate its mixture with the earth, it would be advisable to chop it small with a machine. The conductor of the Farmer's Magazine, although inspired with a due respect for the conclusions of that celebrated chemist, openly opposes this violent innovation on the common practice of the farmer, and asserts, from a long experience, that unless a certain degree of putrefaction comes on in the farm yard, while the putrescible substances are recently voided and possessed of natural heat, no subsequent fermentation will take place in cold and clayey soils. He has known dung and litter, which had been turned down fresh in the furrow, appear next Spring without any visible change. Of course, it must have lain dormant without contributing to the growth of the plants. He states, in support of his own views, an experiment that was tried at the suggestion of a speculative writer: "Dry wheat straw was regularly laid in the hollows of drills; and potato sets planted above the straw. Both were then covered with earth, but very few of the potatoes ever came above ground, and these only towards the end of autumn. When the field was afterwards ploughed, the straw seemed to have undergone no change; nor did it convey any sensible benefit to future crops. Had the same straw been previously subjected to only a moderate fermentation in the dung yard, there can be no doubt but its effects would have been very different." "Truth, says the common adage, lies between;" and in all extreme cases it is safest to steer a middle course.

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* Agricultural Chemistry, Lecture 6, page 284.

It is necessary, however, to remark that the pushing of the putrefactive process to the last stage, and suffering the dung to ferment, till it falls down into black earth, is the most culpable and gross violation of all just agricultural principles, and is now condemned in England with merited reprobation. Long before animal and vegetable substances came to this advanced state of putridity, the nutritive exhalations are gone, and have mingled with the great and imperishable elements of the universe. All that remains is the black carbonaceous matter, which is scarce a sixth part of the original bulk and value. I have myself seen, in more than one part of the Province, many barns surrounded with this decayed earth—the residue of much profitable manure—which was permitted there to go to waste, partly from carelessness, sometimes from ignorance, but generally from a supine and immovable indifference about rural affairs. Such are the blessed effects of our boasted grazing system; and of vilifying and contemning the plough.

This controversy has lost much of its importance since the invention and use of composts. Fermentation—that great destroyer of all organic conformation—is not to be feared by the farmer, if it be conducted and carried on in the presence of earth, which fixes and secures the gases as fast as they are liberated. Even the degree of the process is a matter of less consequence; because if the elementary principles are in keeping, and reserved for future usefulness, it is immaterial, whether this has happened by a new absorption, or by still holding their original and unchanged form. In the composite hill the whole animal or vegetable structure may be dissolved, and leave behind no trace of existence, without the least waste of the principles of fertility; because the ingredients superadded to the dung have become surcharged with them, or to speak philosophically, fully saturated. We may go further and state, that complete decomposition is desirable in this case, which is so much to be avoided in the farm yard; because putrescent matter can only become vegetable food by its resolution into primary parts, and if this be effected by any preparatory step, the young crop receives the full and instantaneous benefit. The compost manure is carried to the field ready to give out its richness on the very first call, and to supply the nascent radicle with a copious share of nourishment.

I believe I have more than once stated that the diversified tribes of the vegetable kingdom are sustained by the circulation of the sap taken up by the absorbent mouths of the fibres. This sap, which is extracted from the soil, holds in solution either the primary or secondary principles of bodies. Whatever, then, is soluble in water, or can be rendered so by the action of chemical laws, combines with the sap and enters into all the interior recesses of the vegetable structure. Both solid, fluid, and gaseous bodies are susceptible of solubility, and of course contribute to the increase and sustentation of plants. Mucilage and sugar, which are solid; jelly, which is fluid; and ammonia, hydrogene and carbonic acid, which are gaseous, are all soluble in

water, and are besides the extracts of vegetable matter; and these by the sap may be drawn in as nourishment, and either transformed by the secretory organs into new compounds, or are still farther analyzed. The sap then is the stream of vital life, and the more it is saturated with nutritive particles, the more luxuriant and vigorous the growth. But it can only be saturated by the dissolution of animal and vegetable bodies, and therefore the more perfect the decomposition, provided the constituent principles have not escaped, the richer the manure. Hence a compost hill may remain for years before it is applied, and be turned over several times to bring on successive fermentations, not only without injury, but with manifest advantage; while the simple dung of animals treated in the same manner would become entirely useless and inefficient.

The putrefactive process may be carried on in the presence of pure earth only, or of earth intermingled with fibrous roots, or lastly, in the presence of peat, which is an assemblage of inert vegetable matter; and compost dunghills may be formed according to this threefold method.

1st. The simplest of all composts is a mixture of barn yard dung and surface mould, taken from a field under regular culture. The proportions between the ingredients are fixed by no determinate laws, and consequently great liberty is allowable to the operator. I have known some instances where two carts of dung were used for one of earth; others, where they were blended in equal quantities; and it is not infrequent to compound two of earth with one of dung. In fact, such is the uncertainty in the composition, that almost every farmer adopts a mode peculiar to himself, and with equal success. No man need therefore follow implicitly the rules which are laid down in this department of rural economy, but may vary and multiply his experiments, according to the suggestions of fancy or the dictates of convenience. If we slightly glance at the principle, we shall see the cause of this seemingly endless variety in the combination of the ingredients. The only use of intermixing the soil with the dung is to imbibe the gaséous elements of vegetable life, and hinder their dissipation. If there be much soil, these elements will be diffused through it with less density and compression; if little, it will be more abundantly saturated, and enriched with the nutritive vapours. Thus, an ounce of sugar may be dissolved equally in a pint or in a gallon of water; and the muriatic acid may be so much diluted as scarcely to exhibit its characteristic properties; and in the same way the products of decomposition may either be concentrated into a small portion of earth or scattered over a large body. The only error, into which the farmer can run, is to supply such an inconsiderable quantity as will be incapable of imbibing the elastic and volatile particles, and thus, by his own mismanagement, occasion a waste of the vegetable aliment. One cart load of soil to two of stable dung is the least proportion which he should ever attempt to combine, and perhaps if the two were mixed equally, he would be compensated for the additional labour and expense.

The whole art of composting is to arrange the materials in alternate layers; to shake up the litter and dung with a hay fork that it may lie loosely; to cover the top and the sides with earth; and to give it a sloping direction that it may cast off excessive moisture. Its height should never exceed four feet, or four and a half; and its breadth should be such, that a man on either side, may be enabled to fling the ingredients into the centre without trampling on the heap: for compression in all cases retards the putrefactive process. If the mass, after being compounded, is long in generating heat; urine, salt or even fresh water, poured on the top slowly, that it may ooze downward, will bring it on with rapidity. On the other hand, should the process advance with too great violence, which can always be known by keeping a stick in the middle, and drawing it out occasionally for trial, the fermentation must be restrained by turning over the dung hill, and mixing anew the ingredients. This will not only put a stop to the mischief, but facilitate a second fermentation; and as fresh particles of earth will be brought into contact with the decomposing matter, the whole will be enriched and impregnated with the fertilizing principles. These general views are applicable to every species of compost, and need not again be repeated.

2nd. Simple earth, although excellent for bottoming and strewing over the pit dug near the barn, is, of all materials, the most unprofitable in compost dung hills. Its superiority in the farm yard rests on this obvious circumstance, that it is employed to absorb the urine, and repress fermentation; but in composting, frementation is courted as the grand agent in preparing the nutritious food; and the whole economy of the plan is to give full scope and action to this mighty despoiler of vegetable and animal remains. He is allured, by every previous disposition, to commit havoc and the wildest devastation, and to revel amidst the unsightly nuisances of corruption. The more ample and diversified the ingredients on which he has to act, the more beneficial and extensive his effects; as he is called in for the express purpose of breaking down, resolving, and destroying all organized contexture. As simple earth—free from all foreign admixture—contains nothing on which the fermenting process can operate, it brings no addition to the mass of fertilizing matter. It is the recipient of the elementary principles, but contributes none of them itself; and as far, therefore, as its agency is concerned, it is unproductive and unprofitable. A matted sward thickly entangled with roots, or mud dragged from the bottom of bogs or ditches, and replete with aquatic plants, are clearly preferable on this account, that, besides bringing earth to the composition, they supply a large proportion of vegetable matter. Whenever the soil must be carted to the heap, it is better to lay out the expense in transporting these enriching materials; because they will not only equally absorb and retain the evaporating gases, but greatly augment the quantum of manure.

"A farmer in Jedburgh* possessed a piece of wet ground in the corner of a field, which he wished to improve. It had long lain in

* Farmer's Magazine, vol. 10. p. 37.

grass, and produced, every season, a luxuriant crop of coarse hay. In the end of the summer, 1814, when the crop was ready for cutting, he employed a person to pare the whole, which was easily done, as the ground was then dry. After paring, he collected the surface together, and having previously provided a quantity of stable dung, he mixed them in alternate layers, about four or five carts of parings for each of dung. He allowed them to remain until the ensuing Spring, when he turned the whole, and found that the vegetable substances in the turf was mostly decayed, and changed into fine dung; and the small quantity of earth had almost disappeared. He turned it a second time before June, and applied it to his turnips, and found that it added much to their luxuriance."

3rd. The most valuable of all composts are those formed of peat; a substance which exists in Great Britain to an amazing extent, but which can only be found here in detached and inconsiderable patches. Whenever met with, it possesses the same properties, and appears under the same forms. It is a mass of vegetable matter accumulated by the annual decay of successive crops, which only grow in a humid situation and at a low temperature. In whatever place water stagnates, there the mossy tribes strike root, shed their seeds, decay, and spring up with the returning warmth of the year. In proportion as the congeries of peaty matter rises above the moisture, and attains a drier elevation, new plants of the same family start into existence, and carry on the formation of the morass. The whole heap is invested with a peculiarity, which seems to set at defiance the general law of destruction imposed on the vegetable world. The plants of this class die during winter, shrink into less bulk, fall down, and are compressed by the succeeding superincumbent strata, but unlike other vegetables, they refuse to yield to putrefaction. Covered with water, which from their action acquires certain chemical qualities, they will lie for ages unchanged; and should any other substance happen, either from accident or from design, to be plunged amongst them, they will transfer to it their own antiseptic virtue. Fermentation and corruption are barred all access to these heaps of insoluble materials; and they were long considered as nuisances incumbering the earth, and tainting the air, till means in the progress of philosophy were contrived to subdue their stubborn nature, and convert them into vegetable nourishment. To such an extent have they grown in the Old Country, that many of them are found thirty feet deep, and covering thousands of acres in a body. They abound in various parts of England, and throughout the whole of Scotland and Ireland; and the principal use to which they have, till lately, been applied, was to furnish fuel to the inhabitants. At top they are light and porous, inclining to a dark color, but their hue deepens as you descend, till it settles in the blackness of coal. At bottom are generally found firs and oaks—the sturdy tenants of the primeval forests—and which were felled, not as in this Province, by the hand of industry and cultivation, but by the axes of the Roman Legions, to make way for the progress of their arms. The ancient Britons, addicted to the rude liberty of a savage life, res[illegible] with the

most obstinate pertinacity the inroads of these civilized conquerors; waged with them eternal war, and though often overcome, were never subdued; as their wilds and fastnesses interposed a friendly shelter. It was at this period that the forests of Britain were cut down, that they might no longer serve as retreats to the natives, and that the country might be brought to submit more readily to the Roman yoke. Amidst the trees thus laid postrate, but not removed, the waters stagnated, and gave a beginning to those extensive mosses which infest the surface of the soil. The subsequent violences which took place, during the invasion of the Danes and Saxons, added to the original calamity, by extending the destruction of the forests; and thus millions of acres were buried below the reach of the plough. In this Province, and in this enlightened age of the world, we cannot be exposed to the same foreign or domestic commotions; neither will we transmit to our descendants a country loaded with such useless unputrescible matter; yet we ought well to mark the origin and cause of the evil, and if possible, arrest it in its progress. Already, deep foundations are laid for the increase of morasses, which may be an annoyance to future ages; unless we take the means of preventing their growth, and of knowing the purposes to which they may be usefully applied. This will be the subject matter of my next letter.

Halifax, December 30, 1818.

TO CORRESPONDENTS.

I have two letters this week from different quarters of the Province, wishing me to call the attention of the Legislature to the vast benefit of surveying the interior of the counties and townships. Mr. Millar, of Truro, assures me that there are fine tracts of land unnoticed and unknown in his part of the country; and that a hundredth part of the good soil is not yet cleared, and under the plough. He recommends the ascertaining of these situations, and opening access to them through the forest by the formation of new roads, which would both advance the public utility and hold out encouragement to new settlers.

I am informed by another writer, to whom I was formerly indebted for a poetical effusion, that he has lately come from the district of Teviotdale, and was employed there in making iron ploughs and harrows; that his master gained the premium, three several times, at the Kelso Agricultural Exhibition, for his improvements in weeding and double moulded drill ploughs; that from his practical experience he considers himself competent to make as good instruments here as in Kelso or Galashiels; and lastly, that he shall send me a model of the latest improved iron plough in the south of Scotland. So soon as this model is received it shall be conveyed to the Provincial Society for inspection and approval.

I have also received the second communication from "Rusticus," on Scotch agriculture; but I am sorry there is no room for its insertion this week in the RECORDER.

No. 25.

ON MANURES.

PEAT, in different countries in Europe, and more particularly in Great Britain, has been applied to three important purposes, with all of which it is our business to be acquainted, for the regulation of our own practice, and the advancement of our agriculture. True, the local circumstances with which we are surrounded, and the peculiarities belonging to a new and unsettled country, prohibit a full and indiscriminate imitation: yet the modes of more mature and perfect societies may offer lessons of a most instructive and interesting tendency. By following their footsteps, we may hope, by slow and sure gradations, to reach their perfection; and by marking and shunning the errors in which they were entangled, we may at least escape the retributory visitation of their calamities.

I. Peat has been much used as an article of fuel. After paring the surface, the lower stratum presents a close interwoven body of fibrous texture, varying from a dark brown to a jetty black, which is cut easily with the spade, and is susceptible of receiving any form. It is customary to divide it into parts resembling in size and shape the common building bricks; and to spread these, during Summer, on the ground, that they may harden and dry. Before Winter, they are removed to the neighborhood of the dwelling, and piled up, either under shade, or in the open air, as suits the convenience of the farmer. In the present condition of this Province, it would be most injudicious to recommend this application of peat earth; and it would be better to allow our swamps to accumulate, than to diminish their bulk and retard their growth, at the expense of all future invasion on the forest. It is clearly our duty to encourage the consumption of timber; and nothing produces a more certain and perceptible impression than the unceasing waste of domestic fires.

II. The attention of several agriculturists in Britain has been strongly directed to the cultivation of peat as a soil. Extensive tracts have been drained, at a vast expense, by cutting ditches in all directions, to carry off the superfluous moisture; horses of slender make have been shoed with pattens, by which to tread on the surface in the necessary operations of improvement; and manure, mixed and compounded with great art, has been carted thither to provide a suitable bed for the seeds. In some cases wealthy proprietors have gone so far as to remove the whole body of the peat from the soil on which it lay incumbent, that they might reach the bottom, and prepare it for the plough. Blair Drummond Moss, in Stirlingshire, is an example of this sort of extraordinary enterprise, which was planned by the celebrated Lord Kames, and is still carrying into execution by the heirs of his virtues and his fortune. The waters of the Teith are diverted from their ordinary channel, and by means of a wheel, singular in con-

struction, but unnecessary to be described, are raised to a certain height, and are conveyed by pipes to the moss which lies at a considerable distance. This constant stream, supplied from the river, flows through a central ditch dug for the purpose, with a regular but gentle motion. Branches are cut from it on all hands, and the waters are thus conducted to the most distant extremities of the moss. These branches again converge, and terminate in a general current, which empties itself into the Forth—an adjoining river connected with the Frith of the same name. The workmen cut the peat-earth into small pieces, and cast them into these running waters, by which they are carried, first into the river, and afterwards to the sea. The process, seemingly so laborious and expensive, has been persevered in with so much well directed energy, that at present several hundred acres are disinterred, brought to the genial influences of day, and are waving every year with a golden harvest. After the peat is thus floated away, new difficulties are to be encountered, before the original soil can be subjected to culture. The ancient trees of the forest, which have lain for ages imbedded under this useless mass, are found incumbering the ground, and lying prostrate by the side of their stumps, which still stand erect, and exhibit marks of the axe. The roots of these cleave to the soil, and like fangs, hold it with a firmness superior to their native and original force: for peat communicates to all timber a strength and durability, which consolidate its texture, and render it in some measure imperishable. In this country it would be madness to reclaim our swamps, either by cultivating their surface, or attempting to remove them. Our agricultural capital can be vested with infinitely more advantage in undertakings less precarious, and doubtless more profitable; and it should be sacredly kept for the clearing of new lands, or the amelioration of the old. All that lies within the compass of our ability and prudence is to check the further growth of these aquatic plants that go to the formation of peat, by opening a passage for the superabundant moisture in all practicable cases; and thus arresting in their progress these nuisances, which are a serious grievance in British agriculture, and which if not obviated by timely precautions, will embarrass and annoy our distant posterity. A moral and enlightened people should be as careful in transmitting their territory improved and uninjured to the succeeding race as in handing down the frame of their civil polity unbroken, or the full and undiminished possession of their rights and franchises. In both cases we owe a duty to our children, which is equally sacred and imperative; for the first entails subsistence and plenty; the last, independence and liberty—gifts of similar importance in themselves, and alike necessary for the well-being of society.

III. Peat has been most extensively employed as a manure; and in this light it possesses distinguished claims to our attention. There has certainly been no discovery in modern husbandry so useful in itself, and so directly conducive to the augmentation and culture of grain, as the art of exposing peat-earth to the effects of fermentation.

By it an inert and unprofitable substance is changed into a most active and efficient manure; and animal and vegetable substances, during the very process of their own decomposition, can be enlisted to subdue the noxious qualities, and to dissolve the organic texture of peaty matter. This body, in its natural state, contains a considerable quantity of tannin, which is a powerful astringent, and resists all approaches to putrefaction; and it is also impregnated with acids, unfriendly to vegetation, and which must be expelled by bringing on a degree of heat created by richer and more fermentable substances.

Various schemes have been suggested by different writers, and these brought to the test of experiment by scientific farmers, in order to deprive peat-earth of its antiseptic qualities, and bring it to a state of putridity. In the field of inquiry have labored, in succession, Lord Meadowbank, William Aiton, and Dr. Rennie, of Kilsyth, each of whom have added something to the previous knowledge, and by their joint efforts they have contributed to place this subject in a very clear and beneficial* light, Dr. Rennie, who is the latest of these writers, has discovered that peat may be divested of its antiseptic and insoluble qualities, by mere immersion in a running stream. The constant flow of water carries off the tannin, and obnoxious acids, and leaves the earth ready to pass into a state of decomposition. He has even found that if a collected heap of this matter be watered copiously for ten days, once every day, its hurtful qualities will be discharged by the mere filtration; and if it be afterwards trimmed up into a compact body, and allowed to dry, will generate a gentle heat, which is perfectly sufficient, although not discoverable by the hand. The Doctor further states that it may be putrified by being exposed to a current of steam; and although this cannot, for the purposes of husbandry, be reduced to practice, it is a curious and interesting fact.

I once had occasion to try the effects of a running stream on peat-earth, and it succeeded beyond my expectations. There was a field which I was anxious to improve, and for which I had not a sufficient command of stable dung. It lay by the side of a river, across which was thrown a mill-dam—used, as most of my readers know, to stem the water and raise it to a higher level, that it might be conducted by a lead or sunk ditch, to the wheel. In this ditch I caused a temporary

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*I have not read the works of these authors for many years, neither do I know whether they can be found in the Province; but my readers must not lose confidence in my directions on this account, because, although I acknowledge these letters to be drawn chiefly from the recollections of memory, and to be composed weekly, and often hastily, with the help of about half a dosen borrowed books—which circumstance should in some measure palliate their defects,—yet in the prescriptions I am about to deliver regarding compost dung-hills, I am satisfied that my knowledge is correct. Agriculture, at one period of my life, engrossed all my thoughts; it was not only studied as a science, but engaged in as a favorite pursuit; I assisted in its rustic labors, and became conversant with its minutest details. The doctrines of Agricola are not, therefore, so much the fruits of his reading as of his experience.

Although this remark was strictly true at the time, yet now, when engaged in the republication of these Letters in 1821, I am in possession of several Agricultural books.

dam to be erected, and threw into the water about twenty tons of earth taken from a contiguous bog. This water, which drove the mill, filtrated through the mass for upwards of ten days, and I then ordered it to be taken out and spread in the sun. When it was in a moist state, between dry and wet—a circumstance which should never be neglected in bringing on fermentation in this inert substance—it was piled up into an oblong square form, about three feet high, and allowed there to gather heat. A slight fermentation came on, and when turned over three weeks afterwards, its organic texture was considerably decayed. I mixed it with about four tons of horse dung, in alternate strata, and I had, in a month, twenty-two tons of as rich and valuable manure as the most enthusiastic agriculturist could have desired. The only use of the dung, besides its own richness, was to accelerate the process.

It would be unjust to deprive Lord Meadowbank of the well earned honor of having been the first who investigated and ascertained on scientific principles, the immense value of this species of manure. That learned Judge, perceiving that peat was entirely composed of vegetable substances endowed with an antiseptic virtue, or "a capacity of resisting putrefaction," instituted a philosophical inquiry into the nature of this singular quality, and the manner in which it might be overcome. From his extensive chemical knowledge, and his diligent and painful researches, he found that this antiseptic power owed its origin to the acids, and the astringent principle of tan; and as these were reduced, in succulent and fresh vegetables, by the hot fermentation to which they were exposed in the full career of putrefaction, he wisely concluded that the same cause would produce in peat the same effects. After varying his experiments in the course of six years, he published the results in a pamphlet, which he distributed gratis, and thus acquired to himself an immortal name in the records of Scotch agriculture. The compost middens of Lord Meadowbank will be known and recollected by the latest posterity, when the decisions which he passed on the Bench, of which he was the prop and ornament, shall have worn away by the corrosive touch of oblivion.

The peat to be used, according to his Lordship's directions, may be taken either from the top or bottom of the bog; but the turfy parts ought to be laid aside, as most unsuitable for the operation. After being thrown out of the pit, it should lie for some weeks till drained of its moisture, and then transported to the field where the compost midden is to be formed. The proportion of the ingredients should be one ton of dung to three of moss; but although these were the proper quantities with the materials which his Lordship employed, it has been found from experience that other proportions may be safely and judiciously adopted. In fact, the mixture should depend on the nature, both of the dung and peat which are to be compounded. Horse dung produces a more violent fermentation than that of cows, and will therefore suffice to decompose a larger quantity; and its power in this respect will also be regulated by its own stage of putre-

faction; for, if fresh, the heat will be more rapid and much stronger than if old and rotten. The nature of the peat, too, must also be taken into account in assorting the ingredients. Some is a pure vegetable body, free of extraneous matter, from its being formed on an elevated situation; other, again, contains a mixture of earth, which renders it brittle, inadhesive and putrescible; because it has originated in a patch of low land, or in the corner of some meadow, liable to be occasionally overflown from the high grounds. When it accumulates in such hollows, its texture is broken by the primitive earths suspended in the turbid waters, with which it is flooded; and in place of exhibiting a matted and organic structure, it resembles the consistence of paste, and is more a fluid than a solid body. Such peaty matter may at once be carted to the arable field, and used as a manure without any preparation; and if thrown into a compost MIDDEN, six loads of it will be easily fermented with one of dung.

But peat is not generally of this character; and rules of composting must be laid down as applicable to this substance, commonly found of a tough and indestructible contexture. As soon as it is dug from the pit, it should be spread out to dry, but not to harden in the sun; for if, by exposure to drought, it changes into a firm, adhesive lump fit for fuel, it is almost impossible, by any known means, to induce afterwards the putrefactive process. When it is, therefore, about half dry, it should be carried to the midden, and first of all laid regularly along the bottom six inches deep, to constitute the first stratum. This should be succeeded by ten inches of dung, then six of moss, four of dung, and so on till the latter is exhausted. Above the whole, a layer of moss should be spread to raise the midden to the height of four feet, and all the materials, from the very beginning, should be piled up in the loosest state, to encourage an incipient fermentation, which comes on, sooner or later, according to the state of the weather, and that of the component parts. It is at this time that the principal skill and care of the operator are called for, to mark and ascertain the progress of the compost; for so soon as it approaches to blood heat, it ought to be watered and turned over with a new mixture of moss, to prevent the dissipation of the useful gases. After the temperature has subsided, the whole mass should be broken down, commencing at the one end, chopping with the spade all the bulky materials, and mixing them in the most perfect manner. A new hill exactly resembling the last should be formed on the same principles, adding either moss or dung as the state of the fermentation indicates; and after a second heat has been generated, which in a few days will become apparent, the heap should be suffered to cool, and it will be instantly ready to apply to the ground; but the longer it remains in the midden, the decomposition will be more perfectly effected, and the elementary principles of vegetation more freely disengaged. In Summer, the whole preparation may be finished in eight or ten weeks, but in Winter no injury will be sustained by keeping the materials in compost till the opening of the Spring. Three tons of moss to one of dung would in this country, I

fear, form an unfermentable compound, from the superabundance of cow-excrement, which is of a cooling nature, and less liable to violent heat; and on that account, I would depart a little from the ordinary rule, and recommend two loads of dung to five of moss, which I do with some diffidence, as I am not in possession of any experiment of the kind that has been tried in this provtnce, although it is clearly deducible from the principles laid down. It cannot, however, be a difficult task to discover the just proportions of the ingredients, as the process itself will soon teach an attentive observer, and lead him infallibly to the proper mixture. He has, on the one hand, to guard against excessive heat, which can always be checked by adding peat; and on the other, to bring on and incite fermentation, which can be accomplished by enlarging the quantity of dung. A slight experience will very soon instruct our farmers in the due medium; and as I have been at pains to set forth the governing principles of the art, the plainest dictates of the understanding will be a sufficient guide in all cases of composting.

It will not, I believe, be unacceptable to my readers to insert here an extract from the small treatise of the learned Judge, which was printed and distributed very extensively for behoof of the Scottish peasantry; and I do this the rather because the subject, on account of its novelty and repugnance to common ideas, may be received with some distrust, unless conveyed in the very words of the author:

"Let the peat-moss, of which compost is to be formed, be thrown out of the pit for some weeks or months, in order to lose its redundant moisture. By this means it is rendered the lighter to carry, and less compact and weighty, when made up with fresh dung, for fermentation; and accordingly less dung is required for the purpose than if the preparation is made with peat taken recently from the pit. The peat taken from near the surface or at a considerabie depth answers equally well. And the more compact the peat, and the fitter to prove good fuel, so much the more promising it is to be prepared for manure.

"Take the peat-moss to a dry spot, convenient for constructing a dung-hill, to serve the field to be manured. Lay the cart-loads of it in two rows, and the dung in a row betwixt them. The dung thus lies on the area of the compost-dunghill, and the rows of peat should be near enough each other that workmen in making up the compost may be able to throw them together by the spade. In making up, let the workmen begin at one end; and, at the extremity of the row of dung (which should not extend quite so far at that end as the rows of peat on each side of it do), let them lay a bottom of peat, six inches deep and fifteen feet wide. Then throw forward and lay about ten inches of dung above the bottom of peat; then four or five of dung, and then cover it over with peat at the end where it was begun, at the two sides, and above. The compost should not be raised above four feet and a half high, otherwise it is apt to press too heavily on the under parts, and check the fermentation; unless the peat, when dry, be very puffy and light, and then a much greater height is desirable. Neither should it

be much lower, otherwise it will prove wanting in compactness, and soon also, if the weather is very dry, in the moisture required for the ingredients of which it consists, to act chemically on each other. When a beginning is thus made, the workmen will proceed working backwards, and adding to the column of compost, as they are furnished with the three rows of materials, directed to be laid down for them. They must take care not to tread on the compost, or render it too compact; and of consequence, in proportion as the peat is wet, it should be made up in lumps, and not much mashed or broken.

"In mild weather, seven cart-loads of common farm-yard dung, tolerably fresh made, is sufficient for twenty-one cart-loads of peat-moss; but in cold weather, a larger proportion of dung is desirable; at least it is prudent to omit putting any peat between the two upper layers of dung, and rather thicken the outer coating with peat. It is also proper in winter, if ground with a dry bottom can be conveniently employed for the purpose, to increase gently the breadth of the dung-hill, which, in that case, may be done without any limit, by adding, all round the dunghill, circles consisting of layers of dung and peat of seven feet in breadth. And if the mass of the dunghill is thus enlarged, there is little occasion to exceed the proportion of dung recommended for making up to prepare in the milder season, especially if a covering of coarse vegetables of any sort, such as waste hay or straw, rushes, broom or furze, or brushwood of evergreens, is thrown over the dunghill. In fact, a covering of this sort is scarce less useful in Summer to prevent the escape of moisture, than in Winter to exclude cold.

"To every twenty-eight cart-loads of the compost, when made up, it is of use to throw on above it a cart-load of ashes, either made from peat, coal or wood, or if these cannot be had, half the quantity of slack lime may be used, the more finely powdered the better. But these conditions are nowise essential to the general success of the compost, provided a sufficiency of time is allowed to the preparation to compensate for the want of them.

"The dung to be used should either have been recently made, or kept fresh by compression, as by the treading of cattle or swine, or by carts passing over it. And if there is little or no litter in it, a smaller quantity will serve, provided any spongy vegetable matter is added at making up the compost, as fresh weeds, the rubbish of a stack-yard, potatoe-shaws, sawings of timber, etc. And as some sorts of dung, even when fresh, are much more advanced in decomposition than others, it is material to attend to this, for a much less proportion of such dung, especially if abounding in animal matter, as is less advanced, will serve for the compost, provided care is taken to keep the mass sufficiently open, either by a mixture of the above-mentioned substances, or, if these are wanting, by adding the peat piece-meal, that is, first mixing it up in the usual proportion of three to one of dung, and then, after a time, adding an equal quantity, more or less, of peat. The dung of this character, of greatest quality, is shamble-dung,

with which, under the above precautions, six times the quantity of peat, or more, may be prepared. The same holds as to pigeon-dung and other fowl-dung, and to a certain extent, also, as to that which is collected from towns, and made by animals that feed on grains, refuse of distilleries, etc.

"The compost, after it is made up, gets into a general heat sooner or later, according to the weather, and the condition of the dung; in Summer, in ten days or sooner; in Winter, not perhaps for many weeks, if the cold is severe. It always, however, has been found to come on at last; and in Summer, it sometimes rises so high as to be mischievous, by consuming the materials (fire-fanging). In that season a stick should be kept in it in different parts, to pull out and feel now and then, for if it approaches to blood heat, it should either be watered or turned over, and on such an occasion advantage may be taken to mix it with a little fresh peat*. The heat subsides, after a time, and with great variety, according to the weather, the dung, and the perfection of the making up of the compost, which then may be allowed to remain untouched, until within three or four weeks of using, when it should be turned over, upside down, and outside in, and all lumps broken; then it comes into a second heat, but soon cools, and is fit to be taken out for use. In this state the whole, except bits of the old decayed wood, appears a black free mass, and spreads like garden-mould. Use it weight for weight, as farmyard dung; and it will be found, in a course of cropping, fully to stand the comparison."

Hitherto I have treated the subject as if excrementitious matter alone possessed the power of effecting and accelerating the putrefaction of moss; and it was this view which Lord Meadowbank chiefly impressed at first on the public attention; but many other substances, he afterwards discovered, are endowed with this same capacity. Here my general theory of putrescent manures receives a collateral and happy confirmation, for it is now found, from a thousand repeated trials, that all animal and vegetable substances, which are capable of being converted by decomposition into the food of plants, are also capable of operating on peat-earth, of dissolving the charm of its incorruptibility, of expelling its poisonous and antiseptic qualities, and of transmuting it into a most efficient manure. Hence, putrid water, the juices of the dunghill, the expressions of the cheese-press, the washings of milk vessels, soap suds, the oils and juices of green flax, urine of all descriptions, succulent vegetables and weeds, dead animal bodies, refuse of fish, night-soil, sea-weed, are all invested with the property of generating heat, and assisting the fermentation of peat; and composts may be formed with all these different ingredients. The carcase of a dead horse, which is often suffered to pollute the air by its noxious effluxia, has been happily employed in decomposing 20 tons of peat-

*In June, 1796, a compost was formed only 2¾ peat to 1 dung; it heated in July beyond the measure of a thermometer graduated at 110 degrees. Part was allowed to stand, part turned over with a half more moss. Three weeks after (18th August) the heat of the former had descended to 84 degrees, while that of the latter had got up to above 110 degrees.

earth, and transforming it into the most enriching manure. This wonderful discovery has exalted the swamps and fens into some degree of agricultural importance ; and promises a new era in the multiplication and production of white crops. The fertilizing virtue of dung is increased quadruple by blending it with this inert matter, and Lord Meadowbank, after a long and watchful experience, declares that the powers and duration of this species of compost, in every diversity of soil, have given returns nowise inferior to the best barnyard dung applied in the same quantity, and states expressly that it is equal, if not preferable, in its effects for the first three years, and decidedly superior afterwards.

There are several other views of this subject highly interesting to the farming class, upon which I dare not at present enter, as my letters on putrescent manures have already swollen much beyond my original limits ; and I must leave the additional matter to some future day, when I may retrace this path of inquiry. I shall deduce one or two practical observations.

I. In a country like this, where there are no large towns, except the capital, whence the farmer can draw manure, our swamps and bogs offer an inexhaustible supply of this useful and indispensible article. Compost middens form an object of prime importance ; and wherever they have been adopted as part of farm management, they have been followed by results of a most flattering and profitable nature. They have tended to multiply the production of the earth, to elevate the hopes of the husbandman, and to give a new impulse to his useful labors. Here they would not only be productive of all these effects, but they would arrest the progress of our morasses, by subjecting them to a waste gradual and constant ; and they would introduce our farmers to an acquaintance with more successfal modes of augmenting manure, so essential to the extended cultivation of white crops.

II. According to the practices which have obtained in this province, we have not above one ton of manure applied to our fields for ten which, from the same stock of cattle, are produced in England ; and, of course, we are not able to cultivate here, with the same means, above one acre in ten, which are there under the plough. To such as have given due attention to the previous details, this conclusion, which looks so violent and extravagant, can be established by the most ample evidence, and is quite irrefragable, without denying the premises which have been built both on facts and philosophy. First of all, the one-half of our putrescible matter is lost entirely by the waste of the urine ; and the other half—the dung—is grossly mismanaged either by the escape of the rich nutritive juices from the dunghill, or by suffering the putrefactive process to be carried to an extreme length. This is not all ; that dung, if composted with peat, would in most cases be augmented fourfold ; and the quality and duration of the mixture are superior, at all events equal to the principal original compound. Four tons of manure, then, may be produced from one of dung, and four tons also may be formed from the urine discharged by the cattle in the

same given time. In a course of experiments by James Arbuthnot, Peterhead, he found "that 300 cart-loads of moss could be decomposed by drenching it with 440 gallons of cattle urine. The foundation of the dunghill was laid one foot deep with moss, and 150 gallons of the liquor thrown upon it. The fermentation came on instantaneously, attended with a hissing noise; the other two layers were then put on, the one after the other, sprinkled each with the urine, and the same effect was produced. Eight days after, the midden was turned, and to all appearances* super-alkalized." It would seem then that both urine and dung, discharged in any given time, are of equivalent value; that each of them, if separately applied to peat, or moss, as it is expressed by Scotch writers. would prepare a quadruple amount of rich and valuable manure; and consequently, as the one here is lost from the construction of our barns, a load of dung is all we have for eight of compost which could be produced from the combined efficacy of urine and excrementitious matter.

If we take, further, into account the putrefactive qualities of seaweed, of dead bodies, either horses, cows or sheep, of common weeds, and of many other substances; I say, if we take into account the power of these in decomposing peat-earth, my general statement will not appear exaggerated, that in this province we have not above one load in ten, which might be procured to replenish the exhausted energies of vegetation. But taking it for granted, that, with a view to strengthen my argument, I have magnified the amount of our loss; and that we could only increase our manures six times above the present quantity, this concession calls loudly for reform, and explains, to the satisfaction of every common understanding, the mystery of our agricultural poverty. We fling away contemptuously the blessings of Nature and of Providence, and instead of blaming our own ignorance and neglect, we curse the climate and the soil, sit down contented with our present dependent situation, and despair of elevating that country on which we tread, and which imparts to us the pleasures of existence, to its proper rank in the scale of national importance.

Halifax, January 7, 1819.

TO CORRESPONDENTS.

I am favored this week with several letters, although they have fallen short of my usual quantity. I have one from Mr. William White, County of Cumberland, containing the history of some seed-wheat, which was subjected to a peculiar process from accident and neglect, and which circumstance proved effective in preventing smut. I shall endeavor to publish it, as the fact is curious and may turn out useful. Chance, both in art and science, has often hit upon the most important discoveries.

*Farmer's Magazine, vol. 16, p. 428.

I have received also the letter of the Revd. Mr. Waddell, containing his specimens of etymological ingenuity, and I thank him for his kind wishes as to the ultimate success of my plans.

The respective letters of Edward Mortimer and Lawrence Hartshorne, Esquires, are in my possession, to which I shall attend ; and I have got one this night so original, laconic and sententious, from Mr. George Gillmore, of Horton, that I cannot refrain from publishing it in his own words :

HALIFAX, January 7th, 1819.

" To Agricola,—As faith without works is dead, so praise without food is dead also. Do me the honour to accept this turkey at my hands, and with it receive the warmest wishes of

GEORGE GILMORE."

I accept this, because the first, with thanks ; but I request my friends to send me in future no presents but such as help to advance my labors.

No. 26.

ON MANURES.

WHEN I treated on soil, my readers will remember that I enumerated and described four earths—sand, clay, lime, and magnesia—as forming its constituent parts. The blending of these in various proportions gives rise to all the diversities of light and heavy, of open and close, of fertile and barren, which cover the face of our globe, and exercise the ingenuity, patience and enterprise of the husbandman. In some cases, Nature lays on the surface only one of the ingredients; in others, two; and occasionally, in the exuberance of her bounty, she unites the whole four into a rich and productive compound. The more perfect the combination of these primary elements, the more fruitful is the soil, because each of them, from the very nature of their original constitution, is adapted to answer some purpose in the economy of vegetation. Clay, for instance, gives firmness and consistence, and is well calculated for retaining humidity; sand, on the contrary, is of a free and porous formation, and admits the roots to range without confinement in quest of their appropriate nourishment. Lime in its caustic state acts as a decomposing agent on animal and vegetable matter, and seems to bring it into a state in which it becomes more rapidly capable of sustaining the herbaceous tribes; but as it soon absorbs carbonic acid from the atmosphere, or combines with it as it is evolved by putrefaction, its utility, in this after stage, must be resolved, partly into its union with other earthy ingredients as a requisite towards their proper texture, and partly into its subserviency in the formation of the vegetable fibre. Hence chalks, calcareous marls and powdered limestone owe their efficacy to their being essential component parts in a fertile soil, and to the minute portion of their matter in plants, which is detected in the ashes after incineration.

Magnesia was long supposed to operate in the same manner as lime, till an outcry was raised against it, and some plausible facts adduced in confirmation of its noxious and poisonous qualities.—These facts have been explained away by ascribing the mischief, not to the presence but to the superabundance of magnesia; and its advocates have contended that lime is equally pernicious when applied in excess. The question, therefore, at this moment hangs in even balance; and further experiments must be instituted before it can be satisfactorily solved. Were we to indulge conjecture on the known benignity of Nature, we would infer, a priori, that no original earth so frequently blended with the soil, could be physically invested with a property destructive of vegetable life, and at variance with that plan of organized existence, for which the material fabric of creation seems to be reared.

From this succinct view it must be evident that the chief fossil manures are no other than some of these primary earths employed by art to supply the deficiencies of nature, and to subdue the stubborn, inert and intractable properties of certain soils. They may either be

applied as we find them on the surface or in the bowels of the earth; or they may be made to undergo certain preparatory processes, which experience has discovered to increase their agency and effect; and in both of these ways recourse is had to them for the necessities of agriculture. Sand, I believe, has always been spread in its native state, whenever compounded with soil; for as far as I recollect in my reading either of ancient or modern writers, no preparation has been resorted to for the purpose of heightening or perpetuating its loosening powers. Lime, on the other hand, which I use synonymously with calcareous matter, has been applied as a manure in its original and native state, as well as after it has been subjected to calcination; and clay, which in the more early efforts of agricultural industry was blended simply with light soils, has lately been exposed to a strong heat in kilns, and found to answer the most beneficial ends.

In the further prosecution of this subject I shall make some observations illustrative of the general character of fossil manures, which will lead to a judicious and salutary application, and will serve to regulate and enlighten our ideas concerning them. That they are distinct from the putrescent is beyond all controversy; and by contrasting the two, and pointing out the effects peculiar to each, my readers will be forewarned against error, and will be prepared to estimate with judgment and precision the tendency of those rules, which I am going to prescribe. It would be a great help to the right understanding of the present discussion if my 13th, 14th and 15th letters were carefully revised, because they constitute the basis of that superstructure which is to be raised in this and some following communications. The whole of this theory of vegetation, which I have been at pains to delineate, is not merely consistent with itself, but derives, from all its parts, new accessions of light and illustration. There is no jarring amongst its members; no contending elements of opposition; no difficulties to reconcile; no laws of matter to thwart or confound; but a harmony and correspondence reign throughout, which are the characteristics of every science built not on wild and vague hypothesis but on facts, experiments and observations. Under the guidance of philosophy, Agriculture has within the last twenty years made more rapid advances than during the two preceding centuries, and has attained a stability, consistence and clearness which have set aside the disjointed and variable maxims of our forefathers, and made us regard the directions of the ancients with a feeling of proud superiority. The writings of Cato and Columella, and the Georgics of Virgil, are vastly inferior, in practical and speculative knowledge, to the reports, memoirs and transactions of the present societies in Great Britain; and the labors of Fitzherbert, of Evelyn, of Mortimer, of Tull, or of Home, weigh light in the scale of literary merit, and betray extremely crude and imperfect notions of the art. The facts which they collected and handed down to posterity are still serviceable in directing our inquiries; but their theories and principles resemble a chaos where all is jumbled in the utmost disorder.

This method of mixing the primary earths with each other was not unknown to antiquity; and it is curious to observe how savage nations, whose pastime was plunder, and whose business was war, could alight upon discoveries which from their importance and value seem the legitimate offspring of more polished times. *Pliny tells us, in his Natural History, that the Ubii, a people who inhabited very fertile levels in Lower Germany, enriched them with a kind of earth, which was found at the distance of three feet from the service. Columella narrates that the mixing of earths of different qualities was no unfrequent practice in his day; and that his uncle—a most learned and active farmer—was in use to compound different kinds of soils, and thereby raise excellent corn crops and enrich also his vineyards. Theophrastus mentions the same practice among the Magarences, and states a peculiarity in their husbandry well worthy of modern imitation. "They turned up the subsoil of their corn fields to the top, by which the mould was deepened and, in fact, renovated, as particles of manure are frequently carried downward by the rain water." All these States, however, seem to have been ignorant of the use of burnt lime, which is of great and incalculable moment, and forms the groundwork of the present excellent husbandry.

I. I observe that the fossil manures operate on the mechanical constitution of the soil, and do not contribute directly to the support and increase of the vegetable. I am aware that Sir H. Davy has discovered certain facts in the structure of plants which seem to contradict this general view, and to found an opposite conclusion. In his Chemical Lectures he has established that the bark is covered with a thin coating, in which no vessels are found, called the epidermis. This in large trees is commonly in a state of decay; but in hollow plants, such as canes, reeds, wheat, oats and various grasses, it is exceedingly strong; and viewed through a microscope, it appears like a glassy network. He first observed that the epidermis of the rattan struck fire with steel, and that two pieces of it, when rubbed together, emitted sparks. This led to the discovery that the epidermis of plants is chiefly composed of silicious earth, or flint; and he thinks this coating defends the tender plants from the puncture of insects, and serves the same purpose to them as shells to many of the insect tribes. This clearly demonstrates that living vegetables are endowed with an energy by which they can imbibe as much of sand as is necessary for their health and vigor, just as oysters and others of the shell tribe can take in as much calcareous earth as is requisite for fabricating that testaceous habitation in which they are enveloped for defence or ornament; or as man can, towards the constitution and formation of his bones, which principally consist of the phosphate of lime. But it would be folly to contend, because flint in plants, and lime in animals, are found, in small quantities, to serve some special purposes in their organization,

*Ubios gentium solos novimus, qui fertilissimum agrum colentes, quacunque terra infra tres pedes effossa, et pedali crassitudine injecta, laetificent. Pliny Lib. 17, cap. 8.

that these earths constitute their food. We know from experience that the human body is sustained by animal and vegetable substances, and that plants live on putrescent manures; and although, therefore, a minute and inconsiderable portion of these primary earths is detected on a chemical analysis of their structure, the general conclusion regarding their aliment is by no means overturned. Neither sand, clay, lime or magnesia enter the absorbent mouths of the fibres as regular articles of nourishment, but are conveyed by means of the sap in an unchanged state, and are afterwards distributed through the organs to answer particular ends of the living structure.

II. I remark that the fossil manures are much more lasting in their effects than the putrescent, and do not stand in need of the same constant and periodical supply. If a sandy soil receive its proper mixture of clay to render it favourable for the growth of crops, its cure is not only complete but permanent. The loam, thus formed by art, acquires the durability of nature, and like her own perfect and stable production, will be equally imperishable. The same effect will happen, should clay be compounded with sand: it will not hastily relapse into its former consistence and tenacity. The fine particles of silicious matter, which have insinuated themselves into its pores, and reduced its cohesion, will continue to exert an influence to the most distant futurity; and no change of crop or mode of culture, can destroy the benefits of the admixture. Lime is exactly of the same nature, and accompanied with the same results. Its consequences endure much beyond those of the putrescent manures; and indeed lands, once limed, possess in all time coming a fertility, which is the infallible fruit of this highly beneficial fossil. It must, notwithstanding, be admitted, that all dressing with mineral manure have not been experienced to entail upon soil these unchangeable and everlasting qualities. Among the ancient *Britons, a man needed only to marl his farm once in his lifetime, but the duty became imperative on his successor; for its effects lasted not more than eighty years. In Norfolk, the mixing of the marly clay, taken from the subsoil, has not extended, in its fructifying virtue, beyond 30 or 40 years: and the powers of lime are supposed to be exhausted in the lapse of half a century. And does not this decay in the fossil manures indicate something like the waste of the putrescent, and lead to the inference, that both are expended by the vital energies of the vegetable kingdom? Without entering into a very minute and learned dissertation on a point so abstract, it is on all hands confessed, that the duration of the fossil manures reaches to a much greater and more remote distance; and this is all I have assumed, and all I meant to establish.

But the difficulty is not unanswerable, and may be solved in perfect conformity with the general theory. After lime has been blended and incorporated with the soil, it begins to combine with barbonic acid, and to increase in specific gravity. It thus gains a tendency to sink

* Hac maxime Britannia utitur. Durat annis LXXX. Neque est exemplum allius, qui bis in vite hanc eidem injecerit. Pliny, ibidem.

downwards, and during the course of successive ploughings, it falls to the bottom of the furrow, and vanishes in the subsoil. Hence the common agricultural maxim that "Dung cannot, but lime may be buried." Every additional turning of the earth by the plough deposits at a greater depth this active but heavy fossil; and the mould, in consequence, requires to be regenerated by a fresh supply. When with this it is taken into consideration, that, according to the more improved modes of husbandry, the plough has been making imperceptibly deeper and deeper incisions, and that what was deemed a sufficient furrow in the days of our ancestors, is now denominated a mere scratching of the surface, it will not appear wonderful, that a dressing of fossil manure, which was sufficiently ample for three inches of soil, will be found inadequate to six. Clay, or calcareous matter, on a sandy soil which was usually ploughed with a three inch furrow, will have little efficacy, when the share turns up twice or thrice that depth; because the additional body brought into action from the subsoil, is not impregnated with the mineral, essential to its fertility.

In addition, as the analysis of plants gives clear indications, that a small portion of all the earths are absorbed by the roots, it is plain that that sort, which exists in the least proportion in the soil, has been exposed to a constant and uninterrupted waste, which in time will affect the general textures, and call for a renovation. On this account, a clayey soil may require a fresh application of sand, as much as of lime; because both have been expended in the course of vegetation; and the predominant earth comes again to exert its peculiar qualities, and overpower those of the others.

But granting this to be an unsatisfactory solution, still it is indisputable, that the permanence and durability of earthy admixtures bear no comparison to the evanescent and short-lived efficacy of the putrescent manures. It has been established by experience, that a field, kept under a regular course of management, must have its fertility restored by a new application of dung, at least once in every four or five years; and that not more than two exhausting white crops must be taken from it during the rotation. If its productive powers be urged beyond this limit, without being recruited anew, the extra exertion is accompanied with consequent languor and debility, and its future strength is enfeebled—just like the animal system which, if strained to any mighty effort, accomplishes it at the expense of its after soundness and vigour.

III. I observe, that by an unskilful application of the fossil manures much real and lasting injury may be brought on any particular soil. Silicious sand may be so accumulated on clay as instead of curing the defect, to superinduce new evils fully more dangerous and inveterate: and clay may be mixed with sand in such exuberance, as to change the quality of the loose soil into the very reverse of its original contexture. Lime may be applied in such excessive doses, as to luxuriate on the very principle of life, and create a complete blank in vegetation. The first dressing of lime, if in sufficient quantity, repays the husbandman with tenfold interest; but the second, and the third, are more

hazardous, and seldom are profitable speculations. Such has been exactly the case in Scotch husbandry: and we are thence admonished, that the original earths, if properly blended and in due proportions, constitute the basis of fertility, but that the predominance of any of them mars the virtue of the rest, and produces barrenness and desolation. Each of the ingredients answers a specific and determinate purpose in the economy and growth of plants; and the perfection of soil lies in a mixture of the whole.

An excess of dung, though contrary to the maxims of good husbandry, is not so lastingly destructive. It causes an extraordinary richness, which is exhausted and carried off by an extraordinary crop; and if the land be kept in tillage for a few seasons, the putrescible matter gradually disappears, and is at length entirely spent in production. The most fertile land can be impoverished by continual cropping; and no remedy has been found to repair the waste, except by the renewal of animal and vegetable substances in a state of putrefaction.

We come then to these grand conclusions, which ought to be engraven on the mind of every farmer; that a soil, consisting wholly either of sand, of clay, of lime, or of magnesia, will be totally unproductive; that the blending of sand and clay constitutes a class, commonly designated by the name of loams which generally require the labour and expense of cultivation; and that when to these is added calcareous earth, the mixture acquires a new character of richness, and rewards by a luxuriant fertility. It is the business of the cultivator to examine carefully the soils under his care, to analize them into their component parts, and whenever lime is wanting, to supply the defect with an assiduity and dispatch proportionate to the importance of the object.

Halifax, January 14, 1819.

TO CORRESPONDENTS.

Since the commencement of these letters, no week has been more productive than this of original and interesting communications. I am not able to publish above the half of the matter transmitted me, and I must crave the indulgence of my friends, who may rest satisfied of the utmost attention being paid to their views, of which I shall take notice on the very first occasion.

I am highly gratified with the letter from "King's County Agricultural Society," and particularly with the respectable names which adorn the list of office-bearers for the current year. This document I shall publish next week; for my printer has already enough of materials. Horton and Cornwallis should each of them have a separate society.

I have received the promised model of the plough, and am glad that we have workmen of such merit amongst ourselves, as they will be the means of answering that demand in machinery, which the excited agricultural spirit must necessarily create. I have forwarded

it to the Provincial Society: and the maker of it will be pleased to accept my thinks.

From Truro I have advice of the great benefit likely to be derived from the late erection of the mill there by Thomas Dickson, Esquire, for grinding oats and shelling barley. I feel joyful that my recommendation has turned the attention of that gentleman to this undertaking, which, I trust, will be as profitable to himself, as useful to the community. Already numbers are resorting to it with their grain: and oatmeal, for the first time, has been introduced into that district as an article of food. This is a great and permanent improvement: and I solicit the agricultural societies to look out for proper sites, and hold out effectual encouragement for such erections throughout the Province. All the settlements of any size and population should, without delay, urge on the building and construction of such mills. They will furnish us with a wholesome and nutritive meal, which is an excellent substitute for flour; and although not so palatable at first, will come by a little use, to be relished in an equal degree. Oats in Nova Scotia never fail as a general crop; and with their assistance, should any calamity befall our wheat, we could contrive to struggle through the year. Oatmeal and shelled barley will be the first leading steps to independence, and will pave the way for that increase of capital in the hands of the agricultural classes, which is essential to a spirited and ardent activity. Poverty depresses the mind, paralyzes energy, and withers the opening buds of national enterprise.

AMHERST, January 7, 1819.

TO AGRICOLA:

Annexed you will perceive the names of the gentlemen who compose the "Cumberland Agricultural Society"; and also the sums which they have respectively subscribed in furtherance of the objects which the society has in view. There were about seventy persons at the meeting, sixty of whom became members, and many others who were prevented from attending by accidental and necessary causes have signified their intention of joining at the next meeting. As it may suit anonymous writers to represent our Society to be composed of the lower order of the inhabitants of the County of Cumberland, you will probably think proper to give the list of its members, and their subscriptions, to your printer for publication; it will be seen by it that the "Cumberland Agricultural Society" comprises a large portion of the Magistracy and of the respectability of this county. You have also annexed a copy of a letter, addressed to one of the members of our committee by Mr. John McFarlane, a man residing at Fox Harbour, in this county, whose character entitles his statement to be readily believed. You will no doubt consider the information therein contained interesting, not only because it is a proof from actual experiment of the beneficial effects which will flow from the general introduction of the drill system into the Province; but also because it shows that farmers will not neglect communicating to the public the results of

their experience when proper channels are opened for that purpose. These channels are the agricultural societies of each district, the benefits arising from the institution of which you have so ably and so elegantly described. Dr. Purdy, the secretary of our county, not having received any communication from the secretary of the Provincial Society, authorizing him to correspond, and the proceedings of the latter not being yet extensive enough to be put in the shape of a formal report, I have taken the liberty of informing you of our progress. The society closed its meeting with reiterated thanks to Agricola. I am much gratified by your requesting my correspondence, and I shall take an early opportunity of sending you a few remarks on the state of agriculture in this county.

I am, sir, your very humble servant,

J. S. MORSE.

A list of sixty subscribers accompanies this letter, and the gross sum of donations and subscriptions amounts to £111.7.8 currency.

DORCHESTER, January 6th, 1819.

TO AGRICOLA:

It may seem strange that I have never sent you either the designation of our society or its constitution; but the one is not yet determined, and the other is not completed. I am of opinion it will comprehend the whole county within its boundaries, and should that be the case, it will be designated "The Sydney Agricultural Society," and its constitution will be so framed (at least as far as we are able to do it) as to make its influence to be felt, and its benefits to extend over all its departments. We have already commenced a correspondence on the subject with Manchester and St. Mary's; and as Col. Cutler is engaged in the correspondence with Manchester, I have no doubt as to its favourable result. We mean also to open a correspondence with Pomquet, Tracadie and the Gut of Canso. In the meantime I have been endeavouring to obtain an intimate acquaintance with every point to which it may be proper to direct our attention, such as the quantity of cleared land, distinguishing what has been under the plough from what is yet under the stumps; the number of acres that were sowed last year, and the different sorts of grain that were put into them; the quantity of each sort of grain that is exported from the county, and the quantity that has been ground at the mills; the amount of live stock, distinguishing the kinds, sexes and ages, with the quantity of butter, bacon and beef that has been sold to the ships, or exported in the course of the year. I have no expectation of getting an accurate return on these subjects, for the first year—but it will form a beginning, and our inquiries may be more successful hereafter. The storekeepers, millers and tradesmen can be of great service to me in the matter, and

so far as I have applied to them, I have met with the greatest encouragement.

I am, sir, your most obedient servant,

THOMAS TROTTER.

At a meeting of land proprietors and farmers of the County of Lunenburg, held within the Court House of Lunenburg, upon the 28th day of December, 1818, the following resolutions were moved by the Reverend Roger Aikin, and being seconded, were unanimously adopted:

Resolved, That the grain produced in the County of Lunenburg is not sufficient for the subsistence of the inhabitants; while the practice of importing flour and other articles of necessity from the United States not only creates a dependence upon a foreign power, which, under certain circumstances, may be used as a measure of annoyance against this Province, but tends to impoverish the country, by draining it of its cash, which never returns to it in the course of trade.

Resolved, That there is at present, or in a very short time may be, as much cleared land in the county as may be made with good management to supply the necessary food, without having recourse to importation, which will not only prevent the cash from being carried out of the county, but to encourage the farmers to persevere in their exertions, till they shall be able to carry part of their produce to other markets.

Resolved, That the only effectual means for obtaining this important end will be the introduction, and general use, of an improved system of husbandry, such as is now successfully practiced in England and Scotland.

Resolved, That the surest method of introducing such a system into general use throughout the country will be the establishing an agricultural society to be called

"THE LUNENBURG FARMER SOCIETY."

Resolved, That such of the persons present in this meeting as are inclined to become members of such society do immediately give in their names, and then choose a few persons as a committee to draw up rules for the government of the society, to be reported to a general meeting, to be held in the same place, upon the 20th day of January next; and when such rules are agreed upon, the members shall elect such office-bearers as may be judged expedient for managing the affairs of the society.

Resolved, That these resolutions shall be made as public as possible throughout the county, and that an invitation shall be held out to those land proprietors and farmers who have not attended this meeting to come forward at the next general meeting and give their support to this most important public measure.

FRANCIS RUDOLF, Chairman

REMARKS.

Mr. Morse's communication, with the list of subscribers, can only inspire one predominant feeling—a feeling to which I dare not give utterance, least I lose all moderation. The late paper thrown into the columns of the Free Press, and signed "A Farmer," is symptomatic of bad humour, and is the first indication publicly given that there are men amongst us who view the progress of the present general rising in favour of agriculture with sentiments of enmity, and who will lay hold of every trifling circumstance to undervalue and embarrass such as are most active. What although the meeting had not been numerously attended! What although the sheriff had not been present! What although even some irregular steps had been taken! Should not every true friend to the interests of that county overlook such petty matters; and as the society is formed, and now supported by magisterial and respectable names, bury in the grave of a generous patriotism his individual wrongs and mortifications. Our present happy prospects will come to nought if this criticising and captious spirit be so freely indulged—unworthy of true nobleness of soul, and plainly evincing a masked hostility. No public measure, in a small community, can be conducted to give universal satisfaction, or even conducted without many faults. The friends and approvers of it cover these with the mantle of charity; its open or disguised opposers anxiously point them out, and expose them to the world.

I am pleased that Mr. Trotter is endeavoring to extend the limits of the association to the whole of Sydney, and I shall wait with some solicitude the event of his laudable efforts.

The resolutions from Lunenburg did not reach me till the 14th inst., and I fear that their insertion is too late for the purpose intended; but the publishing of them is not lost, as they give another proof of the spirit of the country in behalf of our first, our best, and our dearest interests. Mr. Rudolf will please communicate early the result of the next meeting.

Halifax, January 15, 1819.

No. 27.

ON MANURES.

IN the year 1806, I was one afternoon leaning over the grave of Burns, and reading the plain inscription on his tomb-stone erected in the church-yard of Dumfries. This town was the concluding scene of the Scottish Bard; and here terminated his follies and his crimes, the last breathings of his muse and of his life. I was indulging in one of those moods in which pain and pleasure so equally blended that the mind is thrown into a sort of delightful melancholy, for while I retraced many gay and lively recollections, I was forced by present objects to check the rising emotions and embitter them with grief. His enchanting and splendid verses were contrasted, in the eye of fancy, with the dark shades of his character; the strength and manly independence of his intellect with the silly and inconstant waverings of his moral perceptions; the bright and promising morning of his life with the ominous and black cloud which settled on the evening of his days. I was rivetted to the spot; tears filled my eyes; my whole soul was absorbed in contemplation; it was a moment of rich enjoyment. A slow and faltering step struck my ear, and turning round I discovered an emaciated but venerable figure approaching, in the last decrepitude of old age.

"Stranger," said he, "you are paying the tribute of respect to the memory of our poet; and I must beg pardon for this abrupt intrusion." There was such an air of good nature in the old man, heightened by the sense of his helplessness, that I addressed him, frankly in reply, and showed no reluctance to engage in conversation. He sketched to me, with all the loquacity characteristic of his years, the habits, the faults, the drunken broils of the man, while at the same time he appeared an ardent admirer of the faithful colouring, the playful wit, the winning sprightliness of the writer.

"Come," said he, "along with me to the hillock where Burns alternately brutified his senses, or exalted them by the varied inspirations of his lyre." I accompanied him, and we ascended together the mound of earth, on the top of which is the seat—once the favourite haunt of this immortal and extraordinary genius; and alike remarkable for witnessing his fits of intoxication, and in favoured intervals, his effusions of poetic rapture. It is still shown to the curious, lies within the precincts of the town, and commands a fine prospect of the surrounding country. We seated ourselves on the grassy turf, and grown familiar by an interchange of sentiment, we conversed on the most intimate footing. From Burns we soon passed to other topics possessing novelty or interest.

"The country," said I, "in every direction around, and wherever I have travelled, is mostly arable, and highly cultivated. The red and white wheats prevail universally, and are sown seemingly by the farmers in equal quantities."

"Yes," replied the old man, "there is a wonderful change in this district, since I was of your age, for I can recollect this time, when there were neither inclosures nor wheat in all this country."

"Is it possible," I answered, "that all these improvements are of so recent a date as to be within the reach of your remembrance. I should like if you would relate to me the ancient state of the country, the condition of the tenants, and the progress of agriculture."

"That I shall do with all my heart," rejoined my acquaintance, his eyes brightening as he spoke, for like myself he seemed fond of the subject.

"I was born," continued he, "in 1719 in Lochmaben, and am now 87 years of age. The oldest thing I can recollect is the great riot which took place, throughout the whole of this shire, in 1724, in consequence of the landed proprietors beginning to enclose their estates on purpose to stock them with black cattle. The small tenants were turned out, to make way for this improvement; and the ground was fenced by a sunk ditch and wall, called then park-dikes. Great distress was felt in the country on account of this alteration; and the tenantry rose in a mob, and with pitchforks, spades and mattocks proceeded to level all these enclosures, from the one end of the country to the other. My father was unfortunately concerned in that disturbance; and after it was quelled by the help of two troops of dragoons brought from Edinburgh, he was banished to the American plantations for his crime. I lived afterwards and was brought up with my uncle in Nithdale, about 20 miles hence, who rented there a small farm of 100 acres, and I assisted him in working it. The general produce of all this country was grey oats, although the gentlemen in their croft or best lands raised also a little bear or bigg, and some white oats: yet the soil was by all men believed incapable of producing wheat, and accordingly it was never tried. Our common food consisted of these grey oats parched, or burned out of the ear and ground in a hollow stone by the hand; of milk; of †kail; of groats; with never more than one ewe killed at Martinmas for the family. The houses were generally built of mud and covered with thatch; and the clothing was of plaiding—a coarse twilled stuff manufactured at home, from the black and white wool mixed together. Hats and shoes were only worn by the gentry, and even they often appeared at church with a coat of their wives' making. Potatoes were not introduced till 1725, and at first were cultivated with much care, and in small patches. They were carried to the great towns on horses' backs, and retailed at a high price by pounds and ounces. It was about the year 1735 when they came into common use, and before that period there was often great scarcity of food, sometimes bordering on famine, in this fine country, which was then accounted incapable of raising bread for its scanty population. Dumfries at present contains more inhabitants than were then in the whole county; and 20 acres are now more productive than 200 in those days.

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*A species of greens used in Scotland for broth, and called Colewort.

Such was the low state of husbandry that the principal supply came from Cumberland, on the other side of the Esk; and I, myself, have witnessed on the Wednesdays, which from time immemorial have been our market days, sad scenes of real distress occasioned by the swelling of the river, which prevented the carriers from bringing forward the meal, as the want of bridges often interrupted all communication.

"I have seen," proceeded the old man with greater animation, and pointing with the staff in his hand, "all that country before us covered and overgrown with *whins and broom, and not a single vestige of these hedges and stone walls which cross and intersect the whole landscape. A few sheep and black cattle picked the scanty herbage, and they were prevented from eating the growing corn either by a herd-boy who tended them or by a temporary fence erected every year. The common people very often collected nettles in the field, of which they made a kind of coarse soup thickened with oatmeal, and enriched, on great days, by a piece of butter as a luxury. The state of Scotland from my birth up to 1745 was miserable in the extreme; the lower classes were ill fed, ill clothed and ill lodged; and there was no revival in their circumstances till the introduction of potatoes and lime."

"Of potatoes and of lime!" repeated I. "I can perceive some reason why the first should improve their condition, but what connexion had the last with it?"

"Lime," continued my instructor, "operated with more success on the prosperity of the country than potatoes, and I look upon it as the best friend we ever saw."

"Explain yourself," said I, "for all this seems mysterious, and I cannot conceive how lime could have wrought such enchantment."

"To your satisfaction, then, I shall account for it; and my present views have not been altered for the last 20 years of my life. Seventy years ago, in 1738, there was no lime used for building in Dumfries, except a little made of cockle shells, burnt at Colvend, and brought on horses' backs a distance of twenty-two miles. All the houses were either composed of mud-walls, strengthened by upright posts, and these bound and connected together by wattled twigs; or they were built of stone laid, not in mortar, but in clay or moist loam.

"The whole town was a collection of dirty, mean and frail hovels, never exceeding one story; because the materials had not strength or firmness to bear more. These buildings were so perishable, and stood in need of such constant propping, that people never thought of expending time, labour, and money on the comforts of a habitation which was to fall into ruins during the course of their lifetime. Old Provost Bell's house, which was founded in 1740, is the only one now remaining of the ancient town; and although the under story was built with clay, the two upper were laid in lime, which is the cause of its long standing.

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*Furze.

"Between the years 1750 and 1760, the old mud walls gave place to those of stone laid in mortar; and from that period there has been a visible and rapid improvement. Houses acquired permanence, descended from father to son, and the labours of one generation were enjoyed by the next. To lime, then, we owe these stately edifices, with all the comforts and conveniences they confer; and it hence contributed, in a remarkable degree, to the refinement and polish of private life."

"If to this fossil," continued the old man, "we are indebted for the stability of our towns, we are under greater obligations for its unprecedented effects on the powers of the earth. Wheat and clover would not thrive in the County of Dumfries, and on the Stewartry of Kirkcudbright, till lime was plentifully incorporated with the soil; and after its introduction the farmers became rich, land advanced in value, the product multiplied tenfold, population increased, and these counties quickly rose to their present unexampled prosperity. In my younger days, it cost much toil to raise on my uncle's farm, two or two and one-half bolls of grey oats per acre, and after taking one or two crops, the ground lay for four or five years in natural grass, which was coarse and unpalatable to the cattle. The rent—only 2s. 6d. per acre—we found great difficulty in scraping together, and we fell on a thousand shifts to accomplish it. Now, the same farm is rented at £3.10 per acre, is kept under constant cropping, rears excellent wheat, is wholly drained and enclosed, supports a genteel family in all the comforts of life; and one year's rent of it is double the sum which could have purchased it altogether, 65 years ago. It is lime that has warmed and meliorated the soil; that has endowed it with productive powers, and that supports all the plenty and prosperity you have been admiring as you travelled through the district."

He paused; I looked in his face, and a glow of animation had overspread the paleness of age. His right hand was extended in an impressive posture, and his left rested on his staff. The pencil of Titian could not have done him half justice. I rose and bowed; we came down together, and I retired to my apartment in the Inn, to note down the particulars of this interesting conversation.

In this Province we have, fortunately, an immense abundance of lime; although hitherto it has been much neglected, and scarcely applied to use. The benefits of mixing it with the soil seems not to have struck our farmers with the force which the importance of the subject merits; and the few trials which have been made have been conducted with so little skill, and fallen so much short of expectations, that the value of this inestimable fossil has not been sufficiently prized. The cheapness of land; the decided preference in favor of the grazing system; the easy and independent circumstances within the reach of moderate industry; the natural productiveness of a new country, have all operated in repressing the elastic spring of vigorous and spirited exertion. The toil and expense of burning and carting lime to the extent of 150 bushels to an English acre, would have been viewed

like an Herculean effort by men who had encountered the hardships of cutting down the forest, to procure subsistence. There was, moreover, in the early settlement of the country, less necessity for the application of this beneficial manure. The exuberance of vegetable matter incorporated with the soil, and which had accumulated for past ages by the annual decay of leaves and plants, yielded liberal returns under the most careless cultivation. The marshes and intervals, and, at times, the deep loamy uplands were put under the most rigorous and unsparing system of exaction, and crop after crop succeeded each other, till the original richness of the soil was drained. When it refused to pay back the seed and labour, it was abandoned to natural herbage, and allowed to regain its strength by the healing process of nature. Weeds and grasses sprung up indiscriminately, and contended on equal terms for the mastery of the soil; and there are at present vast tracts, which the occupiers are afraid to break up, because the weeds would instantly start into life, and choke whatever grain would be intrusted to the earth. New lands, in such circumstances, have been sought after to furnish bread corn; or the more ruinous expedient has been resorted to of importing it. We are now, happily, ripe for a change. The agricultural classes are beginning to study their profession with keenness and enthusiasm. New and more liberal ideas are gaining the ascendant; a spirit of enterprise has gone forth; the noble, the wealthy, the wise, are striving with each other to raise our prostrate and fallen Agriculture to some sort of eminence, and a few years of such promise will alter the complexion of our affairs.

It is inconceivable what effect time has on the productiveness of the earth. Philosophers have investigated its nature and properties, to find out the secret spell by which it works; and while some have attributed the effect to its power of decomposing putrescible matter, or to its affinity for carbonic acid, others have ascribed it to the change effected on the constitution of the soil. All, however, are agreed, that no land, after its first and natural richness has been exhausted by cropping, can continue fertile without a mixture of this fossil. Its use was the first thing which revived English agriculture after it had long languished in the most abject state; and the first thing too which raised Scotland to opulence and independence. Lime, as a manure, has found its way into France and Germany; and it is blended with the soil along the shores of the Baltic. In southern latitudes this mineral manure is more generally applied, either incorporated with clay in the shape of marl, or combined with the sulphuric acid in that of gypsum.

This whole Province seems to rest on calcareous formations; and limestone and plaster rocks protrude everywhere on the surface. Nature has thus secured its perpetual fertility, by dispensing in such exhaustless profusion the fossil manures. The only difference between these two substances is in their chemical combination, for the base of both is the same: limestone being a carbonate, and plaster a sulphate of lime. The last of these is regularly exported to the United States

as an indispensable dressing; and is there found to invigorate and quicken the principle of vegetation. Here it is neglected, except as an article of commerce; and it is generally reputed to be totally useless on our lands. Of all this I am not only doubtful, but incredulous; and I wish that some experiments were instituted to set the question at rest; for without the testimony of stubborn and well attested facts, no man can believe that the substance which fertilizes in Maryland and New York, and now in Massachusetts, will be inoperative in Nova Scotia. I am aware that climate exercises over the vegetable kingdom a mighty and imperious domain; and that the effects of gypsum here may be less striking, and perhaps less profitable; but that it is altogether inefficient is so compatible with the known principles of order and uniformity, which prevail throughout the laws of matter, that every one has a right to suspend his judgment till the foundation of this opinion be given to the public.

But waiving this questionable point in the meantime, there can be no doubt of the utility of lime. In all Northern climates it has produced wonderful benefits; has been tried here lately with success; and is scattered with sufficient liberality to justify its general introduction. I recommend it warmly to the friends of Agriculture, and I hope this recommendation will not be lost. It is beginning to attract pretty general attention; has been searched for with care in several parts of the Province, and preparations are now making for a fair and full experiment in Spring.

From my own observation, and from the notices of my correspondents, I find that it is met with in most of the townships and districts, not in detached rocks, but very often in wide-spreading and extensive masses; and where it has not yet been discovered, as in the County of Annapolis, this, I trust, has been rather owing to the want of diligence in the search than to the unkindly parsimony of nature. The society in operation there would do well to direct their first efforts and bestow their first premiums in this line of inquiry. It is singular that throughout all that vast county neither limestone, gypsum, chalk nor marl have been detected, although these substances abound in similar situations, and in fact are strewed around with the most careless prodigality.

Limestone has been found in the eastern division of the Province, in the middle and northern districts, and also in those of the west. In Sydney it is met with as a common article, and is frequently scattered on the soil. In abounds in Pictou Island, although the quality is very inferior and stained with a dark admixture—on the East and West Rivers flowing into the harbour—and also along the seashore. In Stewiack it exists abundantly, although till of late the farmers in that settlement were ignorant of the fact, and were in the practice of bringing from a distance what was needed for the purposes of building. In Musquodoboit, the one side of the river is an unbroken chain of lime rock of the finest and purest quality, and is so accessible in itself and so close to the forest that it can be burned for a small expense, not

exceeding four pence per bushel. From this point, traversing the Province northward, we encounter it again in the rivers of Colchester, and in the North Mountain at Onslow; it meets us at the River Philip, at Amherst, at Napan and Maccan, in Cumberland, and no doubt in several other places which I cannot particularize. It is found along the whole course of the Shubenacadie, and towards its mouth the eastern bank is one solid mass of lime. Across the river about half a mile below Fort Ellis it meets our eye in Douglas, and extends along the left bank in detached blocks to the sea; and travelling southward, we discover it constituting the bed of the Nine Mile River, and from thence running back through Hants County till it terminates in Windsor in great abundance and vast variety. These, although numerous, are far from being the only places where this fossil is to be procured. It is plentiful at Gay's and St. Andrew's Rivers, at the Black Rock, and exists in considerable quantities interspersed through the soil in all that quarter. It is in ample profusion at Chester, and is wrought and burned there to much advantage. Along the western shore, it is found in many creeks and harbours, and the kilns here are mostly supplied from that division of the Province.

Lime is found of extremely different qualities; and in proportion as science comes to enlighten our practice, we will turn our attention to the character of the rock from which the fossil is taken. Pure limestone consists of nine parts of carbonic acid and eleven of calcareous earth; and, of course, in the process of burning—which is employed solely to expel the acid by the action of red heat, it will lose 9-20ths of its specific weight as drawn from the kiln. Shells of first quality will require more than their own weight of water to slake them; and every one bushel, when reduced to powder, will measure three. When the lime is intermixed with sand, flint or clay, its loss in calcination will be less, the shells will yield a smaller proportion of powder, and, what is still more curious, will require a less quantity of water. As there are great inequalities in the mixture of these foreign ingredients, so the product in powder and the quantity of water used in slaking may be employed as certain measures of the value of the limestone. The colour, to a certain extent also, ascertains the purity; but this cannot be relied on infallibly, as there may be a portion of magnesia in combination, which, on account of its equal whiteness, cannot be discriminated by the eye. It is plain that when our different rocks come to be wrought, these tests will be of infinite advantage, and point out to the farmer and mason those which will yield the most calcareous earth—the substance which both of them are in quest of, for the purposes of their respective arts.

To the farmer it is an object to cart the lime when fresh from the kiln. By exposure to the atmosphere this earth attracts carbonic acid, and returns to its original weight, usually in the proportion of a twentieth part each of the first five or six days; but if spread out to the air, recovers it much more rapidly. While it is light of carriage it should be transported to the soil with which it is intended to be mixed,

instantly slaked, and then scattered and harrowed on the surface. Delay here is of pernicious tendency if inert vegetable matter is to be acted on, as the causticity of the lime or its power of decomposing animal and vegetable matter is most active in its simple state before its affinity has been exerted on the carbonic acid of the atmosphere; but if the application is meant to improve the earthy texture of the soil, or to supply calcareous matter to the vegetable organization, there is no necessity for such haste, as this fossil, considered as a carbonate, is of infinite value to the farmer, and moreover is supposed by some inquirers to be peculiarly useful in this latter case. Directions* are even given against using it in the former particularly in soils rich in putrescent manure, because it lessens the solubility of those compound products that go directly to the nutriment of the plant.

Halifax, January 17, 1819.

TO CORRESPONDENTS.

I am not so punctual, I doubt, in acknowledging my correspondents, as the importance of their information, and their anxiety for the success of my efforts, deserve. In looking over my file of letters, I perceive one from Horton—written with great care, and touching a subject of some interest. Mr. Hunt complains bitterly of the difference of price between tools fabricated in England and Nova Scotia, and to strengthen his argument, institutes a comparison in figures; and he proposes that a shop, under the direction of each agricultural body, should be erected for making and mending implements of husbandry, and supplying these to new settlers at more moderate rates than those at which they can be now obtained.

I have a communication, also, from Mr. Dawson, in reply to the notice I gave the public regarding the preservation of turnips during winter. He has adopted here, he says, the Scotch practice, and finds it completely successful. On rising ground, he dug a pit of 2½ feet deep, and filled it with roots nearly to the surface. He then spread over them a quantity of straw, and above it a course of turf with the green side downward. The earth thrown out was then strewed over the whole to the thickness of ten or twelve inches, and the work completed by cutting a drain all round, at the distance of three feet, to carry off the surface water. In the month of March last, he took them up in excellent order, having been neither rotted nor affected with frost. In exposed situations he recommends a greater thickness of earth, and by digging the pit a little deeper a sufficient quantity could be provided for that purpose.

He has said nothing on a point connected with this subject, which some farmers dwell upon—that turnips will heat if more than 40 bushels are buried in one place. I request his attention to this ques-

* Davy's Agricultural Chemistry, pages 320, 321.

tion, and call on my correspondents for further experiments and information.

I am apprised from Cornwallis that a society—distinct from that at Horton—has been instituted and has proceeded to the appointment of annual officers, and of a committee. As my information is not official, nor direct from the president or secretary, I shall withhold the names till I hear through the regular channel. The gentlemen appointed, however, I know personally, and I congratulate the district on the choice.

No. 28.

ON MANURES.

THE endeavours which have been made by the British farmers, more especially within the last thirty years, to give the fields under their management a thorough coating of lime, have been unexampled in the former history of the country. So generally has this species of dressing been adopted, notwithstanding the vast expenditure of capital required, that few soils have been neglected in the prevailing ardour for improvement. This fossil, in many cases, has been transported to an immense distance by sea, and afterwards by land carriage into the interior of the country. It has been deemed so effective and essential that the cultivator has spared no expense to regulate and command the fertility which it was supposed to confer, and with a commendable zeal and assiduity he has strewed it upon the upland and the valley, on the cultured field, as well as on the meadow, on dry and light equally as on moist and heavy soils. It has been tried in all situations, under every conceivable change of circumstances, in all seasons of the year, and with an infinite diversity of proportions. The territorial domains of the empire can, with justice, be said to be now completely incorporated with this mineral substance. Hills, which, from their elevation and steepness, were incapable of regular tillage, and were manifestly designed for pasturage, have been limed on the surface, to strengthen and sweeten the herbage; and moors, which were covered with heath, and according to appearance doomed to eternal sterility, have been reclaimed from their natural wildness by its liberal application. In the hand of the agriculturist, it has been found to be the grand agent by which the "wilderness and the solitary place could be made to rejoice," and by which the inert, poisonous and infertile properties of certain soils could be mastered and overcome. To its efficiency in a great measure may be ascribed the admitted transcendence of British agriculture, and the increase of those national resources which enabled the country to feed her growing population, and to struggle for twenty years against the French Republic in that memorable and brilliant warfare, during which every scheme was exhausted by the enemy to cut off her usual imports of corn and throw her back upon the products of her agricultural industry. The operation of the Berlin and Milan decrees, and the unjustifiable declaration of war on the part of the United States, effected, towards the close of the contest, what would have been ruinous to Great Britain at the commencement. Bonaparte actually succeeded in shutting the continental and American ports; and while he vainly fancied that he could starve his antagonist into submission, he seems to have forgotten that the plough was making, all the while, unparalleled progress, and was providing a sufficiency for internal consumption.

Thus, the meditated downfall of the empire laid the foundation of its grandeur; and rich in wealth, in manufactures and in soil, it achieved and dictated a peace by which its power was consolidated, its glory secured, and the tranquility of Europe established.

If lime has exerted so extensive and beneficial an influence on the cultivation of the British territory, it is high time for us in this Province to investigate its nature and make trial of its effects. Although we are threatened by no foreign enemy, and rest fearless under the wing of the parent and protecting state, evils of another nature, and of most formidable aspect, call for the exercise of that energy by which alone we can be saved. It is not possible that we can go on to purchase our bread from our neighbours; and unless some new and unexpected source of prosperity opens, we must either raise or want it. Of this all men seem now to be sensible, and there is not only an active but a generous and patriotic spirit at work, to make the most of our resources. In various quarters our farmers are busied in quarrying and hauling lime, and more of that fossil will be incorporated with the soil in the approaching Spring than has taken place since the discovery and occupation of the country. The labour is great, but the reward is glorious. The melioration of the earth by the admixture of lime is not, like dung, an evanescent but a stable and permanent improvement, which will descend to our offspring. After ages will look back to our efforts, and mention them with honour. Those patriots who now step forward from the throng of vulgar minds, and take a decisive and conspicuous part in the present Agricultural revolution—those who are unfettered by the prejudices of education and early habit, and unmoved by the opposition of ignorance—shall be enrolled in the illustrious records of futurity as the benefactors of the colony and the fathers of its improvement. The more arduous the task assigned to the present generation, the more splendid does it become. We have not only to extirpate and subdue the forest, but to found the beginnings of those towns and cities with which the face of the country, at no distant day, will be animated and adorned, and also to blend with the natural soil the primitive earths essential to fertility. Thus, by the present excitement of public enterprise we are not merely to benefit ourselves, but our children. Every bushel of lime compounded with the earth is a blessing to nations unborn; and in regarding our exertions in this light, the labours of the husbandman become allied to public virtue, and are encircled with the wreath of immortality. The inhabitants of Europe, who thicken upon its soil, and when compared to us, are as twenty to one on the same numerical surface, owe their public roads and bridges, their navigable canals, their villages and towns, their fruitful, cultivated and cleared country, to the progenitors who begat them, and whose efforts, pursued through successive ages, conferred on the earth its superior productiveness and upon the climate its comparative mildness and benignity. The population which swarm in old countries are sustained not exclusively by their own toil, but by the sweat which trickled down the brow of their forefathers;

and we have many difficulties to contend with, and many hardships to encounter, from which our progeny will be exempted.

In the further illustration of this subject, I shall throw out a few hints, first, on the best mode of burning, and secondly, of applying lime, and conclude with a description of its effects on the process of vegetation.

I am aware that the didactic form which these letters often assume renders them less popular and pleasing; and that these technical divisions interrupt that flow of language which is so captivating to a liberal and refined taste; but as my aim, both in the contrivance and execution of this work, has been, not to give a specimen of elaborate and elegant composition, but to lay down a few plain rules to ordinary readers, I have in all cases sacrificed grace to utility and embellishment to instruction. I have seldom gone out of my way to snatch a rhetorical beauty, or to adorn my style with studied or glittering ornaments. Notwithstanding all the critics have lately said these *letters never set up any high pretensions, for, in fact, they are rapid and imperfect sketches drawn at the intervals of leisure, and often finished amidst other avocations. Never, except in one instance, have any of them been twice written over; and I am often obliged to stop in the fervour and heat of composing to correct them for the press. They have never had the benefit of a calm and deliberate revisal, but have been given to the world on the spur of the occasion. If this candid acknowledgment of the faults and defects which must necessarily adhere to them will pacify their enemies, and make their friends less warm and intemperate in their defence, the present war about trifles may be ended, and the public attention, instead of being distracted by personal reproaches and unbecoming defamation, may again return to the advancement of our agricultural interests.

The burning of lime in the old country is principally conducted in public works erected for the purpose, and in the vicinity of the quarries whence the stones are dug. Kilns of various construction and size are built to supply the demand created by the wants of masonry and Agriculture, and the shells are sold at a regular and stipulated rate. Farmers have been known to convey this article a distance of thirty miles, of such essential and pre-eminent importance is it supposed to be in the work of vegetation. In some districts where limestone is abundant, public kilns are less resorted to, and the occupiers of land have found it cheaper, and, they pretend, too, more beneficial to cart home the article in its native state, and calcine it on the field which it is determined to fertilize.

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*This declaration about the hurried manner in which these letters were made up for the press was extorted at the time by the violence of the disputes which were carried on in the public prints. The style in particular was the object on which the two parties spent their animosity—the one, in pouring out its faults; the other, in heaping on it unmerited commendations. I told the fact of its rapid and weekly composition to inspire my friends and enemies with a little more moderation. In appearing now as an author and with the benefit of more leisure and reflection, I cannot claim, though I shall need it, the same measure of indulgence.

In Wales, that identical method has been adopted with respect to limestone, which has been usually employed in the burning of charcoal. The former is placed on the ground in large bodies, which they call COAKS or CLAMPS, is intermixed with fuel, and in that state the fire is applied. The stones are not broken small, as in the ordinary process, but piled up in irregular lumps as they come from the quarry. After the COAK is lighted, and begins to burn violently, turfs and earth are laid around the whole, to prevent the flame from bursting at the sides and top. By thus confining the heat, it is transfused through every part, penetrates the centre of the largest masses, and even extends its powerful and salutary influence to the turf and clay with which it is surrounded. When the fuel is exhausted, and sufficient time is allowed for the heap to cool, the whole, including the ashes and earth, is spread out and mixed with the soil; and some contend that lime so prepared is preferable to what is manufactured at the kilns. According to this plan, the stones are thrown carelessly down, and with the fuel arranged into the form of a pyramid, broadest at bottom, and tapering towards the top. After the fire is kindled, earth and turf are laid on externally as a covering, and wherever the flame threatens to burst out, the place is strengthened and repaired by successive layers of sod.

This practice has been lately introduced into Yorkshire, and is gaining ground upon that of regular kilns. The great quantity of clay which may thus be burnt along with the limestone has proved highly beneficial; and is imagined by some fully equal in its fructifying effects to the calcareous earth. In Shropshire the same ideas are obtaining, and in 1810 I recollect seeing several parcels subjected to this species of calcination, on the road between Newport and Bridgenorth. On inquiry, I learnt that this mode had only been adopted recently, and was found to succeed beyond expectation. The method of burning lime in this Province is liable to no particular objection, as with care the heat may be transmitted to every part and effectually expel the carbonic acid, only it is by no means necessary that the temporary kilns should be excavated in the face of a hill, or other rising ground. It is equal, if not better, to burn it on a level spot, and form the sides with turfs cut from the surface, because these, during the act of calcination, are themselves thoroughly heated and fall down into a powdery fertile manure.

There are only a few directions to be attended to in the structure of these kilns, and a very considerable liberty may be taken by the operator without any material inconvenience. After the spot is selected and the materials at hand, the surface should be pared all round, to obtain a sufficient quantity of sods. These should be constructed into a circular well from 12 to 15 feet in diameter, 30 inches high, and varying from 18 to 20 inches thick. Close to the ground, small apertures about a foot square should be left in the wall to serve as air holes, by which a current may be made to pass through the whole pile, on purpose to sustain and regulate the degree of heat. These holes should be four in number, and placed, two and two, directly opposite

to each other, and, of course, facing the four great points of the compass. The stones and fuel should then be built within the circular wall, and arranged in alternate layers, taking care that the drier and more combustible matter be placed near the air holes, that the kiln may easily be set on fire. A channel of communication should be kept open between each aperture and the centre of the kiln, for the admission of air, and the materials so disposed, that these openings be not suddenly closed by the falling in and condensation of the mass in the first stages of burning. The lowest stratum should contain the greatest quantity of wood; and as the space is filled up, the stones may come to bear a greater and greater proportion to the fuel. When the materials equal the top of the wall, they should then gradually be narrowed and diminished upward to a point. Earth should next be thrown, and with the back of the spade beaten down till all the limestone is covered round and round, with the exception of a small vent for the smoke at the apex of the kiln. The fire should be applied at the aperture into which the wind blows, and the other three may be closed by temporary sods, and after the kiln is lighted, the heat can be regulated by opening and shutting them at pleasure. If the operations be properly conducted, and it requires no great nicety or skill of management, the whole mass will be thoroughly calcined, including the earthy covering as well as the walls, and constitute a profitable and beneficial manure.

Limestone, during the process of burning, loses nearly, as before stated, one-half of its specific weight—which circumstance comes to be of considerable importance in case of distant carriage, and should never be overlooked by the scientific agriculturist. If fuel be obtainable, the calcination should be accomplished in the neighbourhood of the rock, and the shells only transported to the farm where they are to be applied. This saves one-half of the expense of carriage, as a ton of limestone put into the kilns diminishes to eleven cwts. when drawn from it. The shells should be removed immediately, for such is their affinity to carbonic acid that they begin to attract it greedily from the atmosphere, and in a short time will be nearly as heavy as at first. Neither should they be slaked till they are carried to the field for which they are destined, as the eleven cwts., when reduced to powder, will increase to about twenty-three, and from the absorption of the water will be become heavier by the whole of its weight. These calculations are founded on the data furnished by pure lime, but if there be a mixture of sand or clay in the native rock, this conclusion will be proportionately affected.

These general views clearly point out the plan of procedure which our farmers should pursue. If they determine to burn the limestone on their own lands, the Winter months, while sleds can be in motion, should be devoted to the collection of the materials, that no impediment may retard the work in Spring. The kiln should then be constructed and made ready for kindling; but the spark ought not to be applied till the plough has performed its office, and the soil be dry

and mellow for the reception of the calcined fossil. Of such avail is this promptitude and dispatch that when the farmers in Great Britain send to the public works for lime, they always prefer what has been recently burnt, and many of them insist, on purpose to avoid the possibility of imposition, that it be fresh drawn in their presence. Without any regard to its chemical effects, fresh lime, on being slaked, falls into very fine powder—which renders it susceptible of the most intimate mixture with the soil, and consequently, of accomplishing a more thorough and immediate change in its earthy constitution.

In my next I shall continue and, in all likelihood, finish this subject.

Halifax, January 27, 1819.

TO CORRESPONDENTS.

This week has produced only seven letters, but the length and importance of these atone, in some measure, for the smallness of their number. I cannot help expressing the satisfaction I have felt in perusing the friendly communication sent me by T. Roach, Esq., Cumberland. When I had occasion formerly to animadvert on his particular views regarding our climate, I believe that I rather expressed myself too strongly, from the natural ardour to establish the opposite doctrine. On reflection, it occurred to me that respect dictated a private acknowledgment, and I accordingly dispatched him a letter, the general purport of which was, that nothing was further from my intention than to slight his judgment or hurt his feelings. I have received his answer, which to me is highly pleasing. He states, "that he was willing, although still thinking me too sanguine about the climate, soil and seasons of this Province, to forego his own opinion and that of his friends, and meant never more to write anything that might be considered as opposing my laudable endeavours to stimulate the inhabitants of this Province to be independent (if possible) of the United States for bread." He concludes by wishing me complete success and offering any local information he can furnish. I have thought it necessary publicly to mention this circumstance, because I am about to withdraw from observation, and as I am uncertain whether I shall ever again appear and complete my course, I am anxious to be at peace with all men, and to leave the stage without having created one enemy or having acted as Agricola in a manner I would blush to own in my real character. If I know my own heart, I have had no other end in view than the good of this Province in all I have written or done.

From Mr. Isaac Logan I have a letter of which some notice will be taken next week, particularly about his rotation of crops on upland; and I have another from R. Dickson, Esq., replete with varied information, but too long this week for insertion.

A meeting was held at the Court House in King's County, on Wednesday, the 6th January, when a Society, entitled, "The Union Agricultural Society of King's County," was established, and the following officers elected, viz:

Charles R. Prescott, Esq., President.
George Chipman, Esq., Vice-President.
Henry V. Buskirk, Esq., Vice-President.
Robert Bayard, M. D., Corresponding Secretary.
Caleb H. Rand, Esq., Recording Secretary.
James D. Harris, Esq., Treasurer.

It is satisfactory to observe that the meeting was respectfully attended by gentlemen from many remote parts of the country.

ROBERT BAYARD, M. D.,
Corresponding Secretary.

(By order of the Society.)

(CIRCULAR.)

To the Corresponding Secretaries of the Agricultural Societies throughout the Province respectively.

Gentlemen,

The Union Agricultural Society of King's County takes this method of announcing its establishment, and requesting the honor of a correspondence with you: it will feel indebted for whatever agricultural intelligence you may think worthy of communicating, and in return, will take pleasure in forwarding you such information resulting from its experiments, as may be deserving of your attention.

In the mean time, I have the honour to remain, gentlemen, yours most obediently,

ROBERT BAYARD, M. D.,
Corresponding Secretary.

(By order of the Society.)

Horton, January 13th, 1819.

To AGRICOLA,

SIR,—

Few individuals whose exertions are directed to the public welfare, invariably meet with universal gratitude. Those, who are unacquainted with the nature of the improvements that are intended, are too apt to be jealous of them as innovations, which an illiberal mind views as a reflection upon its own vigour; or if we allow a more enlarged construction, considers them at best, as doubtful speculations. But the balance of public sentiment, I trust will greatly preponderate in your favor, with greatful feelings for your disinterested exertions to awaken the slumbering energies of our agriculturists.

The zeal which you have excited, is spreading with increasing rapidity; and, if supported by the persevering exertions of the spirited associations which are reviving and forming throughout the Province, must terminate in our agricultural advancement.

While we acknowledge our obligations to the system you have adopted, and your unshaken perseverance, we are not unmindful of the warm concurrence of his excellency the Earl of Dalhousie, and anticipate the happiest consequences from such exalted patronage; and while in compliance with your wishes, we "give honour to the plough," I hope on our memories will be inscribed

Tribuimus honorem AGRICOLÆ
auctori incognito
qui aratrum honoravit

Permit me, sir, to express the thanks of this society for what you have already done, and its sincere wishes that you may continue to prosecute your laudable undertakings; and moreover, that it may participate in whatever agricultural information the Central Society receives, with which as well as the other agricultural institutions throughout the Province, our society will be happy to open a correspondence.

In the meantime, in behalf of the Union Agricultural Society of King's County, I have the honour to remain, yours most obediently,

ROBERT BAYARD, M. D.,
Corresponding Secretary.

(By order of the Society.)
Horton, January 12th, 1819.

HORTON, January 13th, 1819.

TO AGRICOLA,

SIR —

We are instructed by the King's County Agricultural Society to inform you that they observe with pleasure the exertions you are making to promote a spirit of agriculture throughout the Province, and they consider the letters you weekly publish in the RECORDER, calculated to throw much light on so useful, interesting and beneficial a subject, as well as to bring into practice the exercise of industry, frugality and economy, which must be the essential means of contributing to the welfare and interest of the community. That the soil of Nova Scotia will, in most places, yield a greatful return to the labours of the industrious farmer—many, who have arrived to a degree of opulence through attention to this business alone, can testify, and that too with a slight share of experience and the use of industry. Our crops are as abundant as in many parts of Europe, and we cannot but think, that if the labouring class of people who live by farming were to confine themselves to that simplicity of food which is practised in many parts of the mother country, and to make a more frequent use of the potatoe as a substitute for bread, and to be furnished with mills proper for manufacturing oats into meal, it might supersede the necessity of importing so many barrels of American flour which we otherwise have occasion for—however susceptible of farther improvement the present state of husbandry throughout the Province is, we have just reasons to

express our gratitude to Divine Providence that has so liberally crowned the labours of the farmer in this township for many years past, and for his increasing prosperity in Agriculture. We are unabled to furnish Halifax market with considerable quantities of stall-fed beef, pork, mutton, hay, &c.; our crops of potatoes, if we consider them with regard to quantity and quality, are but rarely excelled; and as for bread corn, we generally raise as much as supplies our own wants, and are enabled occasionally to part with some to the neighbouring townships. These prospects, flattering as they are, might still be increased, but the extreme scarcity of specie, and exorbitant price of labour, are insuperable obstacles to the farmer in practising husbandry or an extended and enterprising scale. It was considered that the late influx of emigrants might have remedied these inconveniencies; but there are but few instances of any who have become permanent residents among us, with views of earning a livelihood by cultivating the soil of Nova Scotia. It is well known that this class of people came almost universally among us in very indigent circumstances; and every liberal encouragement was afforded them by the inhabitants here to better their situation, as they were employed as labourers, although, unacquainted with the mode of farming pursued in this country. Many of them by these advantages, have in the course of two years been enabled to accumulate 50l., and upwards—who came among us pennyless; but they always prove careful to transport, both the money they have earned and themselves, to their beloved country, the United States of America. This, among other causes, has sensibly contributed to the present scarcity of specie, of which many have too just grounds of complaint. We anticipate with much pleasure the advantages that must result from your patriotic and laudable exertions; and the numerous and respectable societies already formed throughout the Province, as well as the zeal and promptness shown by each to second your useful endeavours will, we hope, be attended with the happiest effects. The time is not far distant when we shall not have to depend on a neighbouring country for bread, but be enabled to reap from our own soil an ample supply for our wants.

This society has been organized for 30 years and upwards, and was a branch of a society formed in Halifax at the same period under the patronage of his excellency Governor Parr; and we are extremely grateful that his excellency Lord Dalhousie, and many of his Majesty's Council have patronized and formed a Central Society at Halifax, the result of which will no doubt be of great public good. Our stated times of assembling have been very regularly attended since that period; and the chief objects we had in view were to extend the improvement of agricultural knowledge, and the exercise of industry and rural economy. Your letters published in the RECORDER attracted the attention of many of our members at an early period, but we deferred making any communication to you until our annual meeting, at which time we chose the following gentlemen as officers of our society for the present year:

James N. Crane, Esq., President.
Simon Fitch, Jun., Esq., Vice-President.
Elisha Woodworth, Esq., Sec'y. and Treasurer.
James Hamilton, Esq., Steward.

Elisha Dewolf, Esq.,
Daniel Lockhart, Esq., } Directors.
Sherman Denison, Esq.,

Jonathan Crane, Esq.,
Samuel Bishop, Esq.,
Daniel Dewolf, Esq.,
Mr. Charles Brown,
" Sandford Palmer,
" David Borden,
" James Hamilton, } Committee.

DORCHESTER, January 20th, 1819.

TO AGRICOLA,

SIR,—

Though your patriotic labours have been attended with as much success as the most sanguine mind could well have expected, they have not passed without opposition; and, I believe it would be on the whole an advantage that an opposition should be maintained for some time, as it may serve to keep the public attention alive, and to fix it more closely on the true interest of the Province. Yet, I think it is to be much regretted if any of the friends and patrons of improvement should relax in their efforts, and give occasion for its enemies to triumph. What has been published in the Free Press lately, intends to throw discredit on the country, and shows that there is a feeling of hostility somewhere; and particularly the insertion of the letter from Cumberland of the 5th instant, tended to bring every society throughout the Province under suspicion. The society, of which I have the honour to be president, is yet in its infancy, and the present committee is only an interim one; and for that, and other reasons, I have hitherto forborne to give you the history of our proceedings. I cannot, however, delay it longer, although I consider it as still premature, least a false construction also should be put on my silence.

The meeting on the 20th November when the society was established, was (according to the nearest calculation that I could make), attended by about fifty of the most respectable inhabitants of the district; and the office bearers of the society are as follows:

PATRON—

His Excellency the Earl of Dalhousie, Honorary and Permanent President.

The Honorable Judge Stewart, Ordinary President.

Rev. Thomas Trotter, President.

VICE PRESIDENTS.

The Reverend Colin Grant,
John Cunningham, Esq.,
Alex. McDonald, Esq., M. D.,
David McQueen, Esq.,
Robert N. Henry, Esq.,

TREASURER AND SECRETARY.

Mr. John Munro.

MEMBERS OF THE COMMITTEE.

James Hendricken, Esq.,
John McDonald, Esq.,
Mr. Robert Campbell,
" Joseph Symonds,
" George Jush,
" Simeon Jush,
" Nathaniel Pushie,
" John McKinnon,
" Arch. McArthur,
" David Ballantine,
" William Thomson,
" James Millar.

The list of members at present in my possession, amounts exactly to fifty. The designation of the society cannot be finally determined, nor its constitution completed, till its probable extent is nearly ascertained. It is likely to extend over the whole country. Colonel Cutler has voluntarily offered to exert himself for the purpose of connecting Manchester with it; and a correspondence has been opened on the subject with St. Mary's, which promises to be successful. If it should extend over the whole country, it will be called the Sydney Agricultural Society, and committees will be established in every district to combine all the parts into a whole.

I am with the best wishes for your success, your most obedient,

THOMAS TROTTER.

REMARKS.

After the very clear and distinct communications of Dr. Bayard, I have little to express except my thanks for the very flattering manner in which he mentions my efforts. I am truly happy to see men of education and talent, thronging in from other professions to animate the agricultural energy of the county. These are happy presages; and the spirit now excited will not evaporate in fume, unless it is repressed by discouragement. When the intelligence of a whole people embarks in a common cause, it always discovers the surest and most direct road to success; and I am now satisfied, if the Legislature do their part, of

which I entertain no doubt, that the growing prosperity of this colony will be settled on a firm and durable basis.

I am much obliged to the King's County Society for writing me at their annual meeting; and I rejoice to see such active and useful members in the list of their office bearers. The spirit which now operates with such vigour in that county must usher in brighter prospects than it has witnessed these last thirty years; but it is remarkable that I should never have heard of a society that has preserved its existence for such a period, and kept up stated meetings. In the remarks subjoined to my 14th letter I considered the Hants Society as the only remnant of that agricultural spirit which was excited under the administration of Governor Parr, and which was contemporaneous with a similar movement in Britain that gave rise to the Highland Society of Edinburgh, and to the Board of Agriculture in London; but it seems another spark has been struck off from that fire which blazed here for a moment, and was too suddenly extinguished. The interest of such associations can only be kept alive by cattle shows, ploughing matches, publications or premiums; and when these aids and excitements are withdrawn from the poverty of funds, the institutions themselves are apt to dwindle into little better than a name, and to exhibit no fruits of superintendence.

We have now ten agricultural societies in operation, and if other two were formed, the country may be considered as fully organized. It is singular that no letter has ever been sent me from the western part of the Province; and I have not a single correspondent either in Shelburne or Queen's Counties. Agriculture there is not languishing but literally dead; and it seems to have neither friend, patron, nor supporter. Cape Fourchu, or Tusket, is clearly a station for a society; and some patriotic leader should bestir himself in favor of that county. Liverpool, I am aware, is not a place very well fitted for attention to rural affairs; but the late attempt to found New Caledonia is a proof of a decided movement in its favour, and the first men should unite and form an association.

The Reverend Mr. Trotter's letter is very satisfactory, as to the progress making in Sydney; and I am glad that a gentleman of such public spirit is so honourably exerting himself. I beg of him to accept my best thanks.

Upon the third letter of *Rusticus I have but one remark to make; that the farmers in this Province should read the history of Scotch Agriculture with deep attention. True; it describes another state of society and other difficulties than those to be met with here; but it should lead them, first, to be grateful to the British government for the superior advantages they enjoy in the occupancy of land; and

*A series of letters under this signature made their appearance at this period, descriptive of the ancient state of Scotch husbandry, and of the causes which had conducted it to its present unexampled prosperty. They were auxiliary to the plans of Agricola by instituting a sort of analogy between that kingdom and this Province. Though highly useful at the time, it would interfere with the object of this publication to give them a place here.

to improve diligently the means they possess of raising our agriculture speedily and certainly to a very promising condition. They have none of the obstacles to contend with which beset the Scotch peasantry; and they have a richer soil and more favourable climate. It teaches that there is no permanent source of wealth in any country equal to that dependent on the soil; and that poverty is always the companion of wretched and slovenly cultivation. It is my firm conviction from every new view I take of this subject, that with very moderate exertions the Province can raise ample supplies of grain for its own consumption; and I hope to see the day when these predictions of mine, hazarded at first in the face of much opposition, and against the current of public sentiment, will be fulfilled. That is the object of my warmest wishes, and has been the end of all my labours.

No. 29.

IN my last letter, I pointed out various modes which have been adopted in the calcination of lime, and I now proceed, according to the plan proposed, to show briefly in what manner it should be applied, and to illustrate at greater length its supposed effects on vegetation.

In a young country like this, where the farmers have mostly been drawn from the mechanic trades, without the benefit of previous instruction in the principles or the necessary skill in the manual operations of husbandry, it is natural to expect that many blunders in the first instance will be committed in the management of this manure. Already several abortive attempts have been made at burning it, and the operators have only obtained a few shells from the kiln, which ought to have produced them two or three hundred bushels. This disappointment originated in the unartful arrangement and distribution of the materials; but every error of this kind, instead of repressing ardour, should stimulate to fresh efforts and more persevering diligence. A few failures must not discourage enterprise, nor damp the hopes of ultimate triumph. Perfection is only attainable in any of the arts or sciences by vigour, caution and that unsubdued magnanimity which mocks opposing obstacles, and deems the mistakes of the first imperfect essays as beacons to warn against danger, and to beget greater circumspection. It would be folly to look for other than numerous and egregious faults in the first treatment of lime. Admitting that a strict obedience to the rules delivered in these letters might save from error, it should be recollected that they are read only by a few and even by these in a desultory and unconnected manner. Before we can be tolerably perfect in the burning and application of this fossil, agricultural knowledge which is just beginning to dawn must have attained to some degree of steadiness and splendour. Eminent and scientific cultivators must start up in all, or most, of the districts and settlements; they must pursue the study with avidity and enthusiasm; they must think, reason, dispute and write on its different departments; they must engage in laborious processes of investigation; and thus, from a thousand experiments and a thousand sources, truth will be unveiled and placed on a sure foundation. I must, therefore, forewarn my readers against being too sanguine as to the issue of their first trials. That the most valuable consequences will, in the end, crown their labours is beyond all controversy certain and infallible from the example of Great Britain; but time, experience and some lucky circumstances may be all necessary to extend to us the same benefits.

With respect to the application of lime, I observe that it should be laid on the surface, and not ploughed under the furrow. This peculiarity forms between it and dung a marked line of separation, and serves to establish clearly that these two belong to different classes of

manure. Putrescent matter may be buried by the plough, and yet its virtues will be sensibly felt in the deep verdure and vigour of the succeeding crop. So soon as fermentation commences, the gaseous vapours which are disengaged rise upward from their specific levity, pass through the interstices of the soil, and if not caught in their ascent escape at the surface and mingle with the atmosphere. Lime, on the other hand, has a tendency to sink downwards. From the absorption of carbonic acid it becomes the heaviest of the elementary earths; and if once deposited at the depth of six or seven inches, its usefulness runs some hazard of being for ever lost. Hence it has been found expedient to strew it on the top after the operations of the plough have been completed, and do no more than blend it with the soil by means of the harrow. On all stiff and intractable lands which must undergo Summer fallow to break their cohesion and render them permeable to the diverging roots, the usual practice is to apply lime after they are brought to the most perfect state of pulverization. During Summer they are ploughed in first one direction, then in another, and vexed with perpetual harrowing; and after they have received the last finishing and are prepared for the reception of the seed, lime, newly burnt and slaked, is scattered over the field with regularity and in a measured proportion. The seed is committed to the earth—the harrows are employed to cover it and at the same time to mix and incorporate with the mould the minute particles of the powder. So necessary is this matter accounted that experiments have been set on foot to ascertain the comparative advantages of shallow and deep applications on various and opposite soils, and the uniform result has proved that the balance of profit always inclines to the former. Wm. Dawson—a distinguished agriculturist in Roxburghshire, and who, with justice, may be styled the father of Scotch husbandry—was led to observe the effects of lime according to different modes of treatment on his *farms of Frogden and Grubbit. He was abundantly satisfied that to improve hilly country, which was too steep or too elevated to admit of regular tillage and which could be appropriated to nothing so advantageously as to pasture, the safest course lay in Summer fallowing it, though at great expense, and then liming the surface. In the Spring he sowed some fields with oats and grass seeds and harrowed them thoroughly, that the lime might be well mixed with which they had previously been overspread. By thus preserving the calcareous earth on the surface, he procured the first year a most luxuriant grain crop, and found afterward that the finer grasses started up, and kept possession of the soil to the exclusion of bent and moss—the natural pests of such exposed and lofty situations. But if he were tempted on any particular enclosure to take a second white crop, the plough turned the lime into the bottom of the furrow, the coarse grasses returned, the dung, voided by the animals which depastured it, was less efficacious, and the fertility, on the whole, was materially impaired. This fact,

*Farmers' Magazine, Vol. 13, p. 72.

which has also been established by other testimony no less respectable, suggests to us and enforces the use of QUICK-LIME on newly-cleared lands, after the preparatory work of burning and rolling is finished and when they are ready for the seed. A small quantity scattered on the surface will prove highly beneficial during the whole length of time they remain untilled and while the stumps are decaying. Thirty bushels of shells to the acre, slaked into a fine powder, will produce the most surprising effects, if not on the first crop of wheat, at all events on the verdure, luxuriance and quality of the future pasture; and if twice that quantity be applied, the benefits will rise in proportion. Indeed I am convinced that this is to be the most profitable mode of applying QUICK-LIME in this Province for some time to come, because its particles, long before the plough can be introduced, will have incorporated with the soil, and so altered and meliorated its texture, as not only to insure abundance of sweet grass, but, after the roots are extirpated, excellent crops also, when it is first broken up.

Lime should not only be laid on the surface, but intimately mixed with the soil. It is on this account that a double preparation should take place before its admixture—it should itself be slacked and brought into a powdery state, and the land should be well pulverized. The two bodies will then be susceptible of a close and entire union among their respective particles, and will exert on each other a reciprocal influence and activity. Hence the necessity of draining land before it it limed, that it may be brought into a mellow and friable condition. Dry and favourable weather should also be chosen for this work, and the surface should be previously dressed and every clod broken, either by the harrow or the pressure of the roller. After the lime is strewed and the seed sown, no farther operation whatever should be performed, except what will induce a close and immediate contact of all the parts —so essentially necessary to fulfil the hopes of the farmer.

These acknowledged facts connected with lime, and the rules which are prescribed, must derive their origin from its mechanical or chemical qualities; and I should depart entirely from the principals that have regulated all the past discussions, were I not, in this case, to combine theory with practice, and attempt to show in what manner the above directions are supposed to operate, and command success. The great fault in many treatises on husbandry lies in banishing all scientific illustration, and in delivering the precepts on the authority of the writer, or an appeal to a doubtful experience. Maxims, loosely thrown together without assigning them a proper station in the system, fail to make any sort of impression on the memory, because they convince not the understanding. The rationale of the prescriptions is kept in the back ground; and we are at liberty, either to dispute their expediency, or yield a wavering and reluctant assent. A well constructed and consistent theory possesses many advantages, even though truth were out of the question. It imposes on the imagination by the symmetry and disposition of the parts, it unites scattered facts into order and method, it helps the memory to hold the great and important

truths, and enjoys the same sort of superiority as does a well proportioned and regular fabric, over the same materials thrown down at random and dispersed about the foundation. The efficacy of lime has been attributed to different causes, and much curious investigation has been instituted to explore the secret source of its virtues; and yet, notwithstanding the joint labours of practical and scientific men, there is great room to doubt whether or not they have reached the bottom of the matter, and seen into the hidden workings of nature. I do not presume to set myself in opposition to the great names who have written on this subject; and therefore, in place of questioning their results, I shall select what seems the most rational and philosophical accounts of its extraordinary effects.

Quick and mild lime are characterized by unlike chemical properties, and operate in different ways. The distinction between them cannot be lost sight of without involving every thing in inextricable confusion, and rendering the whole subject dark, inconsistent and complicated. The scientific farmer should not fail to make himself acquainted with both, that he may employ either as exigencies arise, and not betray his ignorance by any injudicious or detrimental application. The doctrines concerning calcareous earth are few and exceedingly simple, and may be remembered without any extraordinary effort. I shall go over the more important, but with extreme brevity.

Pure lime, as it comes from the kiln, may be considered as a metallic oxid, and is the only known combination of the newly discovered metal CALCIUM, and of oxygene—the first being represented, according to the law of definite proportion, by the number 40—the second by that of 15; and lime, consequently, by the sum of both, or 55. It is always of a white color, unless stained by extraneous matter, is biting and acrid to the taste, and its specific gravity is 2.3. In 450 parts of water it is soluble, and like the other alkaline earths it acts on vegetable colours.

This substance, thus succinctly described, is wonderfully prone to rush into new compounds. When exposed to the atmosphere, it attracts the aqueous vapour with great avidity, and crumbles into a fine powder. The same change takes place on slaking it; and in both instances, 17 parts of water unite with it, and convert it into what is termed, in the language of the chemist, a HYDRATE of lime. In this state of combination with water, it is generally applied to land. The shells, as they are vulgarly called, are first slaked, and when they are reduced to powder, are spread on the surface. The addition of the water is not thought either to diminish or to augment its caustic qualities; but only to subvert the cohesion of its parts as a preliminary towards a more intimate union with the soil.

But quick lime, either in its simple state, or after its formation into a hydrate, attracts with great force carbonic acid gas, which consists of one proportion of charcoal 11.4, and two of oxygene 30. Charcoal and oxygene again are known to be chief elementary principles of all vegetable and animal productions, and to be present more

or less in all the arrangements of organized matter. The affinity therefore, exerted on these substances by caustic lime, tends directly to the dissolution of those bodies into whose composition they enter; and gives to it a certain character which, in the hand of the agriculturist, may be employed to much advantage. When inert vegetable matter, such as ligneous fibre, is to be acted on, lime hot from the kiln is clearly the agent to be employed; because in combining with the carbon and oxygene it will occasion a decomposition of the vegetable structure, and convert it more speedily into aliment. Hence in Britain upon moors and heaths, which are in the act of being reclaimed, quick lime is invariably preferred; for the same reason it should be used upon our new lands which are wrested from the wilderness. The abundance of woody matter, in both cases, demands the activity of this powerful and energetic solvent. But according to the opinion of *Sir H. Davy, the application of quick lime should always be avoided on soils containing much soluble vegetable manure; because it combines with the soluble matters, and forms compounds having less attraction for water than the pure vegetable substance. Similar new arrangements take place when it acts on dead animal bodies. It forms a kind of insoluble soap with their oily parts, and then gradually decomposes them by abstracting their oxygene and carbon. It combines likewise with the animal acids, and renders them less nutritive. From the same causes it diminishes the alimentary powers of albumen, and destroys the efficacy of animal manures either by uniting with certain of their elements or giving them new forms of combination. And lastly, it is injurious, he says, when mixed with any common dung, and tends to render the extractive matter insoluble.

Notwithstanding all these precautionary fears—the offspring of chemical creation—the British farmer is mostly in the habit of applying quick lime to all sorts of soils. He brings it in an unslacked state from the public works where it is calcined, lays it on the field where it is to be used, and after it is dissolved either by water or by rain, he spreads it in the shape of powder upon his well-wrought fallows which are mostly rich in putrescent manure. There it rapidly passes into a mild state from its chemical affinity to carbon and oxygene; and although this plan has been long pursued, no consequences have accrued sufficiently alarming to correct the practice. Among men that rank high in their profession, this is still common; on which account it may fairly be presumed that the mischief is not of very fearful magnitude. Indeed caustic lime cannot remain any length of time in the ground without passing into a carbonate and becoming mild. The usual process of putrefaction will supply it with carbonic acid, without having recourse to any extraordinary decomposition brought on for this special purpose. It is well known that when any kind of vegetable or animal matter is accessible to moisture and air, and at a moderate temperature, elastic fluids will be disengaged; and when these are ex-

*Agricultural Chemistry, page 320.

amined, they are resolved into gaseous oxide of carbon, hydro-carbonate, or carbonic acid; so that the natural action of the soil on the putrescent matter deposited in it, is sufficient for the conversion of quick into mild lime. In truth, although hot lime in a powdery state hastens the disorganization of dead substances, its efficacy in this respect must be transient and short-lived; and unless it were useful to vegetation as a carbonate—the state to which it tends by its own affinities—it could not have so long and so justly preserved its station in the scale of the mineral manures.

This is now becoming well understood by all practical men, and it is far from being uncommon to spread the shells of the green sward in Autumn, and leave them to the vicissitudes of Winter, to be dissolved by the snows and rains. The application of lime is matter neither of mystery nor of deep philosophic research. If the necessary quantity be given to land and properly mixed with the soil, it is a thing of much less moment than we are apt to imagine, whether it be applied in its caustic or mild state, and for this reason that there is a natural progression from the one to the other, and in the end it is sure to be saturated with its full measure of carbonic acid. Upon new lands replete with hard and ligneous fibre, quick lime is unquestionably preferable on account of its decomposing agency; but upon all other soils that have been long in cultivation, it is, I believe, very immaterial in what mode it is applied. As a hydrate it is susceptible of the most minute division, and on that account it is generally spread in the state of powder. But at all events it must be acknowledged, that the principal usefulness of calcareous earth results from its action as a carbonate; for in this form of combination it is found in all the chalks, marls, as well as fresh and salt water shells, which would be entirely useless as dressing to land, if quick lime alone had efficacy. Besides, the long duration of this manure can only be explained by referring its virtues to its mild state; for although spread hot, its attraction of carbonic acid is so strong, that it will be united to it in a very short time; and its permanence therefore must be attributed to this last form of combination. And to sum up all, and add force to the argument, pure quick lime, in the shape of powder, is destructive of vegetation. If applied to plants, they turn yellow, and wear all the symptoms of a sickly and debilitated existence; even grass itself may be completely killed by *watering it with a solution of lime.

After these explanatory observations, our attention in the remaining part of this letter shall be directed to the properties, either chemical or mechanical of this fossil regarded as a carbonate; and we shall attempt to shew in what manner these are conductive to the purposes of vegetation.

I. As an original and primitive earth, lime becomes an essential ingredient in all healthful soils. It is as vain to pry into the reason of this necessity, as it would be to inquire into that of siliceous or

* Davy's Agricultural Chemistry, p. 317.

argillaceous earth. All the component parts answer certain purposes in the economy of vegetation; sand breaks the cohesion; clay retains the moisture; and lime assists atmospheric absorption, and is the recipient of the superabundant carbonic acid. Each of them is clothed with an important function; and all, by a happy union, sustain that freshness of beauty, and that rich and bountiful profusion, which the Divine Intelligence has poured upon his works—to cheer, preserve and feed the various orders, that are linked together in the regular and unbroken chain of organized and living existence. As he has constituted Man the sovereign of the creation, and designed him to preside over it by the pre-eminence of his faculties, he has not invariably compounded the original earths in the formation of the surface; but presented them successively either in a simple or in a partially combined state, that scope might be given to the full exercise of our active powers. Had either sand, or clay, or lime in themselves been fertile, or even capable of bringing vegetables to maturity, we would have been doomed to less labour; but as each of them, when alone, is unproductive, and as the blending of them all forms the most perfect soil, a field of exertion is opened to human enterprise, and our "bread can only be earned by the sweat of our brow."

II. Lime has been experienced highly useful in pulverizing stiff and clayey lands. This fossil, on being slacked and mixed with sand, exerts a very opposite effect to this, and constitutes a strong and durable cement which lasts for ages, and becomes as adhesive as the stones that it binds. But when incorporated with the soil, its particles harden by the absorption of carbonic acid, and show no tendency to coalesce into a mass. On the contrary, the liberal use of this manure has so ameliorated the stubborn and heavy clays in the old country, that their tenacity has been destroyed, and their pores opened to give a free and easy passage to the flexile fibres of the crop. In fact, clays and intractable loams would have been in a great measure unfruitful, and could never, notwithstanding all the improvements in machinery and the more skilful modes of culture, have been reduced under the convertible husbandry without the loosening efficacy of calcareous earth. The marshes of Great Britain, in which clay predominates much more then in ours, owe their superior fecundity to the pulverizing effects of this mineral; and they are capable of receiving a much greater proportion of it than light and sandy uplands. No investment of capital pays with a more liberal return than the purchasing of lime to cumbrous soils; and the reason of this is palpable and of satisfactory elucidation. Their grand fault lies in their coherence, and proneness to cake and consolidate after rains. A mixture of sand would to a certain extent rectify this defect, but lime does it more effectually; for it not only causes and multiplies interstices in the soil, rendering it loose and friable, but it imparts likewise the other beneficial effects which result from its application.

On dry and light land, from one to two hundred bushels of shells are accounted a sufficient dose; on heavy loams as much as three hundred have been used; while on clays and stiff marshes some cul-

tivators have gone the length of four hundred, and deemed this quantity neither dangerous nor excessive.

III. Another use of lime, as a manure, arises from its capacity of combining with a greater proportion of carbonic acid, than is merely necessary to constitute a neutral carbonate. Pure rock lime, I have formerly observed, consists in 100 parts, of *55 of calcareous earth, and of 45 of carbonic acid. During calcination the 45 parts are expelled, and the shells remaining and taken from the kiln weigh the other 55; but when exposed to the atmosphere, these last will absorb again the 45 parts of which they were deprived. This compound is denominated a carbonate of lime, and is always so found native in the earth. It is sparingly soluble in water; nor will it part with the carbonic acid to which it closely adheres, by anything short of red-heat. Were lime capable of forming only this combination, its usefulness in agriculture would be much curtailed; but fortunately it can admit of another, and besides the 45 parts already mentioned can absorb an additional quantity of carbonic acid, and form, what is called in the chemical nomenclature, a HYPER-CARBONATE. This possesses two remarkable and distinct properties. In the first place, it is highly soluble in water, which accounts for the admission of lime into the structure of plants; and in the second place, this excess of carbonic acid adheres very loosely to its base, and is liberated without any extraordinary degree of heat. All this can be rendered plain by a very simple †experiment. If carbonic acid be added to lime-water an instantaneous union takes place, and the resulting compound is precipitated; but if more acid be poured into the mixture, the carbonate again is redissolved. On leaving this exposed to the air, the excess of carbonic acid escapes, the mixture again assumes a milky appearance, and a whitish precipitate is formed, which is the neutral carbonate.

As this acid is a most important article of vegetable food and as it is copiously evolved in the putrefactive process, the calcareous earth fixes and prevents it from escaping, forms with it a hyper-carbonate, and readily imparts it, in union with water, towards the nourishment of the crops. It is supposed to do more: it unites with the carbonic acid floating in the air, and when there is a scarcity of aliment in the soil, it seizes and secures this food in the atmosphere, and afterwards dispenses it according to the calls and necessities of vegetation. Hence the propriety of laying lime on the surface. In this position, it is ready to combine with the carbonic acid which is generated by the fermentation of putrescent matter lying at lower depths and which naturally ascends; and also it can attract the same gas from the circumambient fluid with which our globe is invested. In this two-fold

* These are the proportions given by Kirwan of native carbonate of lime, which he supposes to be those also of the artificial carbonate after the expulsion of its water by heat. The results found by other chemists nearly correspond with this—by Vauquelin the parts being 56 of lime and 43.5 of acid;—by Bucholz 56.5 and 43;—by Aikin 55.5 and 44;—by Thenard 54.34 and 43.28;—by Marcet 56.1 and 43.9—and by Berzelius 56.4 and 43.6——Philosophical Magazine, vol. xi. page 117.

‡ Murray's Chemistry, vol. 3, page 47.

manner, it contributes to supply the vegetable tribes with an ingredient so essential to their existence, and forms so large a portion of their bulk.

But notwithstanding all these circumstances of acknowledged utility, nothing has been found so dangerous as to overcharge the soil with this fossil, since it becomes, when existing in excess, destructive and poisonous in a very superior degree. Liming in some parts of Scotland has been pushed so far that vegetation has been blasted under its withering malignity. The crop in such circumstances runs to straw, fails in the production of a full and heavy ear, bends by its own weight, and sinks prostrate under deluging rains. I am not in possession of sufficient data to specify exactly the quantity which should be applied to all kinds of soils; neither do I know if the fact be any where correctly ascertained. On all of our intervals and uplands, 150 bushels of shells per acre may with safety and confidence be spread; but more would be hazardous in the present state of our knowledge.

As an exuberant dose of lime is pernicious, so any quantity, whether great or small, is useless on poor and exhausted land. It is an undoubted fact that when a field has been worn out by continued cropping, it is in vain to lime it for the purpose of restoring the powers of fertility. Dung, in this case, would be beneficial, but calcareous earth is hurtful and ineffective. It lies dormant in the soil, either till putrescent manure is added, or till rest and time have replenished the natural herbage, on both of which it begins quickly to operate.

IV. Lime is an ingredient in the organization of plants, and must serve some important end in the exercise of their functions. It is afforded by their ashes usually in a combined state with carbonic acid, and forms part of the matter insoluble in water which remains after incineration. This property of being found in the vegetable fibre is not peculiar to lime, for it belongs to the other three component elements of soil, only the calcareous and silicious earths are more frequently met with than magnesia, and it again more commonly than clay. Plants appear to possess an accommodating power in this instance, and to take up such earths as principally exist in the bed that supports them, but always in small portions and not above the fiftieth part of their weight.

Sand and clay blended in a greater or less proportion constitute by far the most part of that superficial covering with which our globe is invested, and of course the generality of soils is made up of them. They are the chief materials found on the surface in every country and in every climate, and an artificial mixture of them, though in many cases highly conducive to fertility, is seldom called for, because nature has done the work without any assistance from man. But she has distributed lime with more frugality, and most soils are deficient in this respect till ameliorated by art. Accordingly, we discover at the very opening of ancient history and in the infancy of tillage, a solicitude on the part of the earliest cultivators—the Greeks, the Margarenses, the Ubii, the Romans—to supply this fossil that the ground might yield its fruits in perfection and abundance. As agriculture has advanced

during the last two thousand years, lime has been growing in reputation, and has now become essential in every modern system of farming. From experience it is known that many of the crops cultivated for human subsistence will not reach their full vigour and luxuriance till calcareous earth, in some one or other of its combinations, is scattered on the soil; and wheat, in particular, requires the presence of the carbonate to attain its highest productiveness. It would be an unprofitable and unavailing labour to pry perhaps into the mysteries of vegetation, in order to explore the cause of this phenomenon, for these processes are almost always conducted in the dark, and by their effects only do we become acquainted with their existence. Yet it is notorious that new lands in northern latitudes are adverse to this grain, till they are incorporated with lime. Whether this repugnance to produce wheat originates in a defect of texture which is corrected by this mineral manure, or whether lime be essentially necessary for the proper organization of the stem and seed, are questions which cannot be easily solved in the present state of science. We must wait till more light is thrown on those secrets of the vegetable economy, and in the meantime rest satisfied with the knowledge of the fact that lime is indispensible in the production of superior wheat crops. Without it, it must be confessed that this grain will grow, and in very favourable situations grow vigorously; yet it cannot be denied that since the plentiful use of lime has been adopted,* lands in Europe will produce wheat which otherwise were incapable of bearing it. The rye lands of Herefordshire, which were reported by Dr. Beale in the year 1636 as incapable of producing wheat, have been so much fertilized, by the subsequent †introduction of this fossil manure, as to be successfully applied to the growth of that and every other grain. This and similar effects may be referable in part to the subservieney of this earth in the more perfect formation of the vegetable structure, for we know that birds, if confined in a cage and denied all access to lime, will lay eggs with soft shells—a most surprising instance of defect where the reproduction of the species is concerned. So wheat may labour under some such analogous imperfection, unless the carbonate comes within the range of its roots.

V. Lime adds to the absorbent capacity of the soil. The chemical property is of great account in the production of crops, and intimately connected with fertility. The nature of it even by the unlearned is not difficult to be understood, and is susceptible of an easy explanation. Every one the least versant with the simplest rudiments of knowledge has heard that the atmosphere holds a certain quantity of aqueous vapour in an invisible and elastic form. The constant evaporation going on at the surface of land and water is the source of supply, and as this must be greatest in dry and hot weather, the air is so constituted as to enter into combination with different portions of it,

* Marshall's Review of the County Reports to the Board of Agriculture—Vol. 2, 247.

† Duncumb's Herefordshire, page 47; also page 107, under the head "Manuring."

according to the degrees of temperature. When the mercury is at 49 degrees Fahrenheit, the air holds about a fiftieth of its own volume of moisture, and at 100 degrees, about a fourteenth, so that the proportion of atmospheric vapour increases with the heat. The final cause of this beautiful and beneficent contrivance needs no comment, as it is the ministration of divine goodness under the guidance of intelligence, to fulfil the greater wants of the vegetable creation.

There are three ways in which water or its elements existing in the atmosphere are made conducive to the growth of plants. From the electrical changes occuring in the upper regions of the air, oxygene and hydrogene are caused to combine in the formation of water, which descends according to the season, in the shape either of snow or of rain. By these means the surface of the earth is refreshed and saturated with sap, to carry on the vegetable processes. From the alteration of temperature, again, the air holds suspended a greater or less portion of aqueous vapour. A decrease of heat invariably leads to a deposition of water; and hence the dews in summer, from the comparative coldness of the nights. And lastly, plants themselves and the soil on which they subsist, possess this power of absorbing this watery vapour by the mere energy of cohesion attraction. The leaves unquestionably are endowed with a capacity of this kind, and the constituent parts of the soil enjoy it likewise in different degrees. Vegetable matter seems to be more absorbent than animal, and lime much more than sand. The calcareous hills in Derbyshire and North Wales exhibit a striking contrast to those of sandstone—the verdure of the one being deep and beautiful, the grass on the other looking brown and parched; and these different tints are referable to the degree in which they enjoy the power of atmospheric absorption. The soils which, from experiment, have been found most efficient in attracting moisture are those in which there is a mixture of sand, clay and carbonate of lime, with some animal and vegetable matter, and which are of so loose and friable a texture as to be freely permeable to the air. The evaporation of the day is counterbalanced by the absorption of the night, and thus the plants are supplied with a regular and just share of humidity.

As this property belongs eminently to lime, and can be most effectually exercised in contact with air, it suggests the reason why this manure should not be ploughed down, but lie near the surface. In that situation it can best exert its absorbent power in behalf of the crop, and more readily drink in those liquid stores which are reserved in the very constitution of the atmosphere for the dry and scorching season of the year. It also gives a most satisfactory explanation of certain *facts which have forced themselves on the notice of the more observant. On the application of lime it has been found that the succeeding crop receives more benefit from a warm than from a cold summer; that grain of all sorts is later in ripening, because from the increased action of atmospheric absorption the land is kept cool and a

* Dancomb's Herefordshire, page 108.

more vigorous growth communicated to the plants; and lastly that wheats on limed fallow seldom appear superior, until the weather becomes hot in June.

All these illustrations which have been made on lime are equally applicable to chalk, marl, sea sand and shells either of fresh water or of marine origin. The calcareous matter in all these forms of combination is a carbonate, and of course its operation is to be explained on the same principles. In this Province, marl, consisting of shells various in their size and shape, has been discovered at Windsor, and in the neighborhood of the Shubenacadie; and doubtless will be found in other quarters when the spirit of research has quickened a little the movements of our farmers. Chalk, so far as I know, has not been alighted on here in its native state; sea sand has not yet been brought into use, and shells are still thrown aside as worthless. The carbonate of lime, under whatever modification it appears, should be held in higher estimation, and ought to be incorporated with our soils as an essential principle of their productiveness.

Halifax, February 3, 1819.

TO CORRESPONDENTS.

My letters this week have been numerous and valuable; and I must thank my wellwishers for their increasing anxiety to give me information. There is no part of my public duty which I discharge with more painful feelings than the choice I am forced to make among my communications, of those to be marked out for the press. In this selection I am less seldom guided by their intrinsic merits than by their immediate reference to the subject-matter which I wish to bring before the public attention. I have suppressed well-written pieces sometimes because they touched upon discussions foreign to the point in hand; and at others, because they were interwoven with political questions not very intimately connected with our Provincial Agriculture. The first I kept out of view, because they possessed no present interest; the second, because I was unwilling to introduce topics which are rarely agitated with temper, and which might have divided the friends of our prosperity into outrageous and contending factions. Besides, it was not the province of an anonymous writer to give publicity to the many sage advices, which were meant to pass through him to the ear of the Legislature. I have stuck closely to my subject; and nothing sent me from any quarter, or from any person, whatever his rank, has been withheld, which could throw light on these details.

I shall feel obliged to the gentleman from East Lothian for the set of tables which ascertain the weight of cattle by measurement; and he, I hope, will be pleased to see that his suggestions regarding lime have not been forgotten in this day's letter, and that the chemical causes of the facts have been assigned.

I have received a most excellent letter from the Rev. Mr. Ross, abounding with practical and valuable matter, which was only meant, he tells me, for my eye; but I must request as a favour that he gives me permission to publish it. His projected statistical account of the District I shall be happy to receive.

My accounts from Cumberland are rather of an ominous complexion. Two parties there seem inflamed with the most violent animosity; and both have appealed to me with mutual criminations. As far as my experience has hitherto gone, Agriculture has always operated in soothing the passions of mankind and in allaying the fierce strifes which are engendered by the turbulance of politics. The earth, like an indulgent mother, equally fosters her children; she is impartial in the distribution of her gifts; the abundance of one man has no connection with the poverty of another, for she dispenses to all according to their exertions; and on these accounts there should be neither jealousy nor rivalship in Agricultural pursuits.

No. 30.

LIME, which has been the subject of attention in the last letters holds the most important and conspicuous place among the earths. It is used not only extensively in Agriculture, but is necessary in many of those arts and manufactures which serve to the existence of society, and in some of them which minister to its elegance and ornament. In medicine it is employed as an antacid and astringent, and in practical chemistry it is susceptible of numerous applications, dependent on its peculiar agencies on the neutral salts and the animal and vegetable products. The tanner, the soapboiler, the bleacher, have successively to call in the aid of its affinities, for next to the alkalies, it has the most diversified and multiplied relations. Its abundance and diffusion bear some correspondence to this its great value; and it exists in the stratification of our globe sometimes as the principal, and sometimes as a subordinate ingredient in the primary and secondary rocks. In feldspar and mica—two of the component parts of granite—it is very generally detected, and the purest species of marble is composed entirely of chrystallized carbonate of lime. Among the class of secondary formations it appears as limestone, as calcareous sandstone, as gypsum and as chalk. It is contained in most waters which flow either on the surface or in the bowels of the earth, as well as in those of the ocean. It insinuates itself into vegetable structures, and forms the basis of the shells and bones of animals.

In these numerous arrangements it is presented to us under a great variety of forms and in a state of combination with the different mineral acids. With several of these the scientific farmer has no sort of connection, because they have never been applied in the shape of manure; and to admit of such use, they are either too rare or procurable at too great an expense. His views are to be chiefly confined to four states of calcareous earth, namely, the pure alkaline earth itself in the form of quicklime, and its treble combination with the carbonic, the sulphuric and the phosphoric acids. The two first of these have been already examined—the two last are now entitled to some elucidation.

Sulphate of lime, or gypsum, exists in immense masses, and of late has been much used as a means of creating fertility. The phosphate of lime occurs in different forms, and as phosphorite lies in extensive strata in Spain, though as a manure, it is derived rather from the animal than the mineral kingdom. This saline body goes principally to the composition of bones, which, both ground and burnt, are now greatly applied in England as a dressing to land.

Gypsum is composed of 55 parts of lime and 75 of sulphuric acid, and this latter is the gas usually sold by the druggists in a liquid form as the oil of vitriol. If this and quick-lime be added together in due proportions, a violent heat results, and on igniting the mixture, the salt is formed. In nature gypsum is found in two states—as a combination

of lime and of sulphuric acid free from water, when it is called anhydrous selenite; and again, as common plaister, which contains in addition to the acid a considerable quantity of water, and its composition may be thus expressed:—

Of sulphuric acid, one proportion 75
Lime, one proportion 55
Water, two proportions of 17 each.....34

In this Province gypsum is found in both these states; more rarely in the first, but in the last it exists in unbounded profusion, and seems quite inexhaustible. Since the settlement of the country, the numberless cargoes shipped to the United States have made no sort of impression on the rocks; and though the trade were carried on for thousands of years to come, no fears can be entertained of emptying this vast mine of mineral wealth. All the creeks and inlets which indent the shores of the Bay of Fundy present such masses of this fossil, generally in perpendicular cliffs, as to beget the idea that the supply is endless and unlimited. Indeed it appears to be the predominant stratum of the country, and has been an object of commerce for many years past.

It must appear singular that an article, which has been sent so long to our neighbours as a fossil manure, should have been entirely neglected among ourselves; and that no one has instituted a set of experiments to ascertain its effects on the soil of Nova Scotia. A notion generally prevails, that here it would be ineffectual in consequence of the lower temperature of our summers compared with those of the Southern States, but an opinion, like this, of so vague and unphilosophic a character ought to carry with it no degree of weight; for it supposes, that the mode of its operation is by attracting moisture from the atmosphere, and thus furnishing sap to the plants in an arid soil and sultry climate. But this is matter of pure hypothesis. Gypsum, when combined with water, holds it so firmly that it can only be deprived of it by a heat at least equal to the boiling point—a fact, that is daily proved by the plaisterer in preparing it for casts and the other purposes of his art. He puts it into a pot, applies fire to it in order to drive off the 34 parts of water, which in their escape produce the appearance of ebullition. Common gypsum, so soon as their expulsion is effected, becomes analogous to the anhydrous selenite, and suffers no change in the definite proportions of the lime and acid. The dry powder is a pure sulphate of lime, and the power it has of combining with water is preceptible in the rapid setting of the paste formed of it, and the very great hardness it acquires in the moulds. A substance which parts with water at so high a temperature, and afterwards absorbs and solidifies that fluid so strongly, must be ill calculated to supply plants with moisture; and therefore its action as a manure cannot philosophically be traced to this source. It might have been apprehended, too, that the very small quantity used on land, not exceeding from two to six bushels per acre, would have been distructive to such a conjecture, and

led men to seek for its fertilizing principle in some other property. And this attempt has been made, and its influence referred to a supposed power of decomposing vegetable and animal matter. Sir *H. Davy tried some experiments on this subject by mixing minced veal and pigeon's dung with plaister, but the results in both cases evinced that gypsum increases not the rapidity of putrefaction.

If there be some difficulty in finding out the mode of its operation, there is much also in ascertaining on what soils it should be applied. Of all the manures drawn from the mineral kingdom none seems to be so capricious, and none has given rise to such discordant sentiments, both among farmers and theoretical men. In some counties of England it has entirely failed; whereas in Kent it has been of signal advantage, and very favourable accounts of it were returned to the Board of Agriculture, particularly by Mr. †Smith of Tunstall, who states, "that from three to six bushels of this saline compound of lime spread over an acre of different species of herbage, had much more than doubled the produce, and left the soil in condition to yield a superior crop the following year." In Switzerland, Germany and North America its effects are visible and universally recognized; in Ireland and Scotland it is little, I had almost said never used; and in England its usefulness is a subject of controversy. To add to our embarrassment, clover, sainfoin, and most of the artificial grasses furnish it on analysis; while it is scarcely detected in barley, wheat, peas and turnips—a proof that it is restricted in its operation to particular crops. And further it is so generally diffused, that it is found more or less in almost every soil, in spring and river water, and much of it in stable dung.

From these multiplied, discordant and various facts it is hard to elicit anything like a principle of order, by which to reconcile and harmonize them; and though we should happily alight on something of this description, it cannot be received with a full and unwavering assent, but must be merely regarded as a mode of explaining the difficulties till time and a more enlarged experience shall offer a correct and philosophical solution. The details of this investigation seem to centre in two conclusions; first, that a very small portion of gypsum is all that is required to be efficient, and that this small portion exists in some soils native, and in others may be carried thither in an adventitious manner, as by water flowing on the surface, or in the manure. In the second place, as this saline body is found on analyzing all those plants whose growth it is known to invigorate, this other inference seems to come out with much plausibility, to wit, that gypsum is essential to the perfect organization of such plants, and enters their system to perform some important office—most likely to strengthen or consolidate their structure. If we go into this belief, a friendly light is struck out to guide us in this benighted path of enquiry. In all those tracts

*Agricultural Chemistry, page 331.

†General Report of Scotland, vol. 5, page 75.

of country where plaster is distributed with great liberality, it will be mixed more or less in every soil, will partly be suspended in the spring and river waters, and will be generally diffused among the grasses which are made into hay. Such a territory will be sufficiently impregnated with this fossil manure from the operation of ordinary causes, and will require no direct application of it by the farmer. If he raises Indian corn, or sows artificial grasses, a proper dose of gypsum has been already administered to the soil in the very stable-dung with which he fertilizes it, or in the decomposition of the strata from which it is formed. A *gentleman is Yorkshire tried gypsum on two of his estates without the least benefit, and was thence induced to have the land examined by chemical tests. This substance was found in both the soils in such plenty as to render all further application of it needless; and therefore the failure of his experiments was easily and obviously traced to this circumstance.

Should this explanation of these facts turn out correct, we can account for the wonderful efficacy of plaster in the United States. That vast range of country is almost devoid of this fossil; and therefore a dressing of it to Indian corn and clover supplies those plants with what is indispensable to their organization; while in Nova Scotia, on the other hand, where it is most abundant, it must be of limited operation, because most soils contain it in considerable quantities. But in several counties of this province, particularly to the Westward, no trace of gypsum has been hitherto detected; and Annapolis is very parsimoniously suppled, if it all, with any of the calcareous strata. In that quarter the sulphate of lime, according to the principles of reasoning which we have assumed, ought to have the best effects; though in all other places, it should prove inoperative. But before any deductions can be firmly established on this interesting question, a very extensive set of experiments must be instituted, that we may appeal to the only legitimate authority in farming—the laws and operations of nature, and not be misled by the fancies of a mere theory.

The phosphate of lime which is another combination of calcareous earth with an acid, is of much less importance regarded as a manure than the carbonate and sulphate; but it occupies a place here which cannot with any propriety be left void. This saline body is met with in the three kingdoms of nature, and may be contemplated as a manure of vegetable, and animal, as well as of mineral extraction. It exists in excrementitious matter, and in the stems and ears of wheat, barley, oats and rye; so that it is mostly conveyed to crops in the composition of the putrescible substances with which they are nourished. Lately, too, it has been conveyed in another form. The chemical student knows that it is the principal constituent of the bones of all animals; and although these hard substances have been long regarded as of little or no use to the farmer, the science of agriculture has made the discovery, that when ground into powder, and applied at the rate of from

*Agricultural Chemistry, page 333.

sixty to a hundred bushels per acre, they answer an excellent purpose, and confer a richnes for ten or twelve years. The bones are sometimes burnt before they are broken down, but the better method is to send them to the mill in an uncalcined state; because the powder will then not only contain the phosphate of lime, but the other animal products with which it is combined. In the West Riding *Report of Yorkshire it is mentioned, "that bone-dust is used to great extent upon all the fields for twenty miles round Sheffield. Bones of all kinds are gathered with the greatest industry, and are even imported from distant places. They are broken through a mill made for that purpose, and are sometimes laid on the ground without any mixture; but it is supposed most advantageous to mix them up with rich earth into a compost, and when fermentation has taken place to lay them on the ground." The price at the mill is 18d per bushel; the call greater than can be supplied. In other parts of England this new species of manure is in equally great request; and of late in the neighbourhood of Edinburgh—the capital of Scotland—the bones of horses and other animals which lay scattered and neglected around the precincts of the city, as the wrecks of the last century, and which were blanched by the rains and winds of heaven, have been collected with much care, to satisfy this extraordinary demand.

But although the phosphate of lime be thus derived from vegetable and animal substances, it must be strictly regarded as of fossil origin. Gypsum, common salt, the carbonate of lime and of magnesia are all minerals, and yet they introduce themselves into the composition of organized bodies, and are conveyed with stable dung to fertilize the earth. None of the neutral salts are the peculiar products of vegetable life, like mucilage, sugar or gluten, and although detected in the remains of living structures, they must be held in the light of mineral manures, and placed under that head of classification. The phosphate of lime exists in some places of the British Islands native, and in very small quantities; but in Estramadura—a province of Spain—it lies in extensive strata, and passes under the name of phosphorite. Its colour is yellowish white, without lustre or transparency; and when heated or rubbed, it displays a high degree of phosphorescence.

Another variety of this fossil has received the denomination of †apatite, and occurs in a crystallized form. This consists of 55 parts of lime and 45 of phosphoric acid—being analogous to the proportions of the carbonate of lime. The colour of the crystals is white, green or blue, of various shades, and their lustre is resplendent.

The phosphate of lime appears under a third form also crystalized, and of an asparagus green colour—on which account it has got the name of asparagus stone. It is soluble in the nitric and muriatic acids, but does not, like the other varieties, show any phosphoric light on being thrown into the fire.

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*Page 153.

†Murray's Chemistry, vol. 3, page 559.

Although neither one nor other of these kinds, so far as I know, have been dug out of their native strata, and applied by agriculturists to the manuring of land, it is fair to infer, from the analogy of natural operations, that they would have a beneficial effect, and answer the same end as the phosphate of bone dust. At all events it is incontestible that plants and animals require this saline body to give firmness and solidity to their structures; and that they have the capacity, the one, of absorbing portions of it from the earth; the other, of separating it from the promiscuous mass of aliment, and assimilating it into bone —the material of which is constructed the frame of the body.

Magnesia is one of the four primary earths which go to the composition of ordinary soils, and, like lime, is possessed of alkaline qualities. It changes the blue vegetable colours to a green, and readily combines with the mineral acids. According to some, this body is destructive; to others, favourable to vegetation; and a contest has been maintained on this head which has divided the agricultural world into two parties, who are yet very far from coalescing. Much of this difference of opinion has originated in the unskillful method of applying magnesia, for it seems to be a law of the fossil manures that whenever in excess they act with a pernicious energy. The quantity called for by the nature of the plant under cultivation must be administered to bring it to the highest possible state of fruitfulness and perfection; but if this limit be transgressed, there arises a very opposite effect, and disease and barrenness are the inevitable consequences. The alkalies, the alkaline earths, and all their various compounds with the acids, exemplify this law, and as far as experiment has yet proceeded, it seems of universal operation. Sir H. Davy in the Summer of 1807 tried the effects of the alkaline saline compounds on barley and on grass, growing in the same garden. Their solutions were used twice a week, in the quantity of two ounces, on spots sufficiently remote from each other to prevent any interference of results. The salts thus submitted to experiment were the carbonate, sulphate, acetate, nitrate, and muriate of potash; the sulphate of soda; and the sulphate, nitrate, muriate and carbonate of ammonia—all of which are combinations of the volatile and fixed alkalies with the corresponding acids indicated by the names. He found that in all cases, when the quantity of salt equalled one-thirtieth part of the weight of water, the effects were injurious, but least so in the instances of carbonate, sulphate and muriate of ammonia. But when it equalled one three hundredth part of the solution, then the different salts operated on the grass and corn, some of them without any apparent benefit, and others with an increase of luxuriance. To this mode of explanation all the disputes, perhaps, concerning the influence of magnesia are referable. When sparingly applied, it is useful in modifying the texture of the soil, or in contributing to the organization of the plants; when in superabundance, it becomes mischievous like the other fossil manures.

But that the noxious qualities ascribed to magnesian earth, without any regard to the quantity in the soil, is of very questionable

authority, or rather unworthy of belief, is attested by the common practices of several English counties. In Derbyshire the magnesian limestone is so plentiful that the public roads are frequently mended with it, after it is broken into small pieces. These in a short time are bruised into an impalpable powder by the constant pressure and friction of carriages, and in that state are partially dissolved in every shower that falls. The thick water running from these roads, about *Plesley, is carefully collected into pits for the purpose of causing them to deposit the sediment, which must obviously be a compound of calcareous and magnesian matter. This, by the farmers in the immediate neighbourhood, is carried off as a valuable ingredient to their composts—a practice which would be instantly checked if this fossil were of such destructive operation.

The pure magnesian earth, uncombined with any acid, is somewhat analogous to quicklime by acting in its caustic state as a poison to vegetation; but when it becomes mild, and passes into a carbonate, it is beyond all doubt beneficial to soils; and numerous experiments, prosecuted by different individuals and at different times, have made this out with a fullness of evidence which cannot be mistaken. The carbonate of magnesia may be thrown on grass or corn till they are completely whitened, without the slightest injury; and heavy crops may be raised on lands which contain it in considerable proportion.

Other compounds of magnesia with the common acids have been favourably spoken of, and both the sulphate and the muriate have been subjected to proof by the scientific agriculturist. The first of these salts is found in the waters of the ocean, and largely in the mineral springs at Epsom, from which place it has derived its name in commerce and medicine. The second of these is that substance which, next to common salt, is contained most abundantly in sea-water, and has a very nauseous taste. Both these saline bodies are distributed with extreme parsimony throughout the mineral kingdom, and can only be procured, in a separate state, by very expensive processes. This precludes them from being ever used to any extent by the practical occupier of land; and, in fact, they never have been employed as manures, except when they have been conveyed to the soil in the application either of salt water or sea-weed.

*Marshall's Review, vol. 4, page 136.

No. 31.

ON MANURES.

IN the progress of investigating the mineral manures, we now approach a new and distinct order of bodies, that have the most extensive chemical relations, and exercise a powerful influence on vegetable life. The fixed alkalies, potash and soda, are so abundant in the organs of plants, that from thence they are chiefly furnished for the purposes of commerce; and combustion is the process by which they are both obtained. The manufacture of potash is no mystery to the inhabitants of this Province, who are in the daily practice of separating this alkali from their wood ashes by lixiviation, and of adding to the ley some fatty matter in order to form a soap for domestic use.—Soda, in like manner, is procured by the burning of marine plants, and appears under the form of kelp and barilla. The vegetable kingdom in both cases is the source whence these alkalies are derived, and some *inquirers from this, have been deceived into the belief that they are the products of the vegetable living principle, and are elaborated out of the elements of air and water. But for this opinion there are not the slightest grounds. When we look into their composition we discover their bases to be peculiar metals, so prone to attract oxygen, that they cannot exist pure in the sap or other aqueous fluid; and therefore the presence of water, or of air containing water, would at once convert them into the alkaline state. The conclusion is irresistible, that they are of mineral origin and distinct from the other forms of matter with which we are acquainted; at least, none of the elements of our atmosphere, or of water, have yet been resolved into any thing resembling them.

But we are not left to guide our way by the mere thread of chemical analysis. There is proof of the most direct kind, that both of the fixed alkalies are allied to minerals, and are blended with the primary and secondary rocks. Granite, for instance, which geologists acknowledge to be the most ancient of the strata constituting our globe, is composed of three ingredients designated by the names of feldspar, quartz, and mica. The feldspar contains silicious and argillacious earths in various proportions, along with lime and magnesia; and one variety of it presents us with potash, where it must have existed from the beginning of things, and anterior to the birth of organic nature. Soda again is the base of common salt, which abounds not only in the bowels of the earth, but is diffused extensively throughout the waters of the ocean. We need not therefore hesitate a moment to transfer these substances to the mineral manures.

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* M. Schrader and M. Braconnet.

Besides these two alkalies, there is a *third named ammonia, or the volatile alkali, because it exists as a gas, which is some service in promoting vegetation. The efficacy of soot upon crops has always been referred to the ammoniacal salts which enter into its constitution; and both the carbonate and acetate of ammonia, procurable from the distillation of coal, are reported to be useful by same agriculturists. Further, animal bodies in a state of putrefaction are always discharging a stream of ammoniacal gas; and one grand argument in favour of composting is founded on the necessity of preventing such wasteful expenditure, and retaining this and other volatile matter in the substance of the manure. Thus the alkalies appear to be most important agents in the functions of vegetable life, and the most decisive evidence of this is their abundance and diffusion in all plants which grow either in air or in water.

There can be no doubt that both of the fixed alkalies enter very largely into the vegetable organization, and constitute there an essential ingredient. On burning forest timber and sea-weed, a very considerable quantity of potash can be gathered from the one, and of soda from the other; and this demonstrates that these bodies pre-existed in the stems and leaves before the action of the fire. It is perhaps impossible to say for what exact functions they are designed, but if we advert to their chemical qualities some scattered rays of light may be collected on this head.

They are themselves not only highly soluble in water,—but they give solubility to bodies which have not this property. The manufacture of soap, both hard and soft, affords of this the very best illustration. The vegetable oils and the animal fats are all incapable of being mixed with water, and they either swim on the top, or lie at the bottom in an unaltered state. But when there is added potash or soda, they become miscible in a very high degree. The greasy matter which issues from the human skin, and adheres to the vestments with which it is concealed and protected, could not be expelled or washed out without the assistance of soap containing the alkali that unites to the fat and gives it solubility.

A fine instance of this power is manifested in the manufacture of glasss. Flint, or silicious sand, is among the most intractable of bodies to be brought to a fluid state by the application of heat; yet as soon as alkali, either the vegetable or mineral, is blended with the sand, the mass becomes fusible in the furnace, and can be blown and moulded into that endless multitude of forms, which as glass or crystal, constitute the chief ornaments of our table.

It is now well-nigh correctly ascertained, that both the vegetable and animal manures afford nutriment, not by being resolved into their

*In Murray's Chemistry, vol. 2, page 635, a fourth alkali is said to have been newly discovered in a mineral, named petalite, taken from the mine at Uto in Sweden. It has a greater resemblance to soda than to potash, and like them has a metallic base. Neither its properties nor its salts have been fully investigated; but because found in the mineral kingdom it has been called Lithina.—No experiments have been made to ascertain its action and relations in agricultural chemistry.

ultimate elements of oxygen, hydrogen, carbon and azote, but by furnishing their peculiar products in their ternary combinations. Whatever part of these is soluble, or in other words, can be mixed with water, pass at once into the tubes with the ascending sap, and is solidified into the organs. In this way may be disposed of, mucilage, sugar, albumen, jelly, tannin and extract; but gum elastic, wax, resin, the fixed oils and the carbonacous part of woody fibre must undergo some change, or be assisted by some new chemical affinity, before they can be miscible in water and find admission into the plant. The known attraction of the alkalies for OIL points them out as the obvious means of giving solubility to this single vegetable principle, and of paving the way for its ascension in the tubes; but on the other products enumerated, and which are insoluble in water, I believe the alkalies have no sort of action. Into saturated solutions of soda and potash I dropped pieces of wax, resin, and caoutchouc, and also powdered charcoal, 5 grains of each; and after their immersion for three days they were weighed and found unreduced in quantity.

Another office of great importance seems to be performed by the alkalies, and that is, the varying and mixing of the colors which diversify and adorn the infinite productions of the earth. Whoever contemplates that gay and glorious robe which invests animated nature, cannot but admire the endless variety of tints with which it is chequered. The original colours run into each other with so much delicacy of shade, or are set off into such pleasing and surprising contrasts, that the eye wanders over them without disgust or satiety. The alkalies and the acids are the means to put into motion all this gorgeous machinery; and so simple is the contrivance, that it can be easily exemplified by art. Indeed, changing vegetable blues into green is one of the tests by which the alkalies are known; and the acids again are distinguished by tingeing them with red. No experiment, in the whole circle of chemistry, is so beautiful and striking as this, nor more within the reach of the ordinary student. Take a leaf of the common red cabbage, and pour over it a quantity of boiling water. When it cools, draw off the infusion which will have acquired a deep blue or purple. Into a wineglass full of this liquor, drop the smallest piece of potash or soda; and instantaneously the blue will be changed into green. Then pour into it a little of any of the mineral acids, such as the muriatic, the nitric or the sulphuric, and the green will return first to the blue, and on adding more acid, will pass into a red colour. That red color can be again subverted by the addition of alkali, and brought back to a green; and this change from red to green, and from green to red, can be effected alternately by any one of the acids and alkalies, as is the will of the operator. Other vegetable infusions are equally under the influence of these two classes of bodies. The yellow of turmeric, for instance, passes by the addition of alkali into a dark brown; and the infusion of tea becomes paler by the application of an acid:—so that it would appear that the infinitely varied hues of plants, shrubs and trees are derived from the mixture and

saturation of acid and alkaline matter, or the predominance of the one or the other. In spring and summer the alkalies prevail, and spread an universal green over the face of nature; in autumn the acids gain an ascendant, and make their power manifest by the turning of the leaf into brown, yellow, olive and red.

Potash is used in this Province as a manure to a very great extent; as it is a principal ingredient in the wood ashes of those trees which must be cut down and consumed, to clear away the forest. In all parts of the country the fuel consists much more of wood, than of pit coal; and on that account, a very considerable quantity of the vegetable alkali must be thrown into the dunghill with the sweepings of the hearth, and thence carried to the fields. We are thus in a situation to estimate the effects of this manure, and to draw our conclusions with the greatest certainty. Wood-ashes by all our new settlers are relied upon as giving an abundant first crop; and this is one cause why our wilderness lands are taken up and occupied much faster than the state of our population justifies. The crop of wheat, after the timber is felled and burned, is generally so good as to reimburse the whole outlay for clearing and fencing; and the whole manure employed is the carbonaceous, alkaline and saline matter that composes the wood ashes. The grain is sown on the blackened surface, and harrowed in without other preparation among the stumps. These, although usually from three to four feet in height, are covered and concealed by the growing corn; and this happens even on ground of no great original fertility. So great is the effect of the alkaline and carbonaceous matter that remains after incineration.

The power of potash to accelerate vegetation may be inferred from its abundance in all parts of plants that grow on land. It is contained in their leaves, branches and stem, and exists in straw, haulm, weeds and succulent herbs, as well as in shrubs and trees. Experiments have been even conducted by Kirwin, Vauquelin, and others to discover the relative quantities of alkali which may be furnished by different vegetable productions: and their results seem to point to the following conclusion—that herbs yield a more copious supply than shrubs, and shrubs more than trees. In 10,000 parts, the oak afforded 15, and the beech 12; while the vine gave 55, and fern 62: but vetches produced 275, beans 200, and wormwood 730. Their analysis were extended to several other plants, and these invariably strengthened the general inference. Nay, further, it was found that leaves afforded a greater proportion than the branches, and the branches more than the stems—a fact rather singular, unless we should suppose, as alkaline matter is the chief cause of that universal green which is spread over living nature, that it is distributed with a view to this effect. The leaves are generally of a brighter and livelier hue than the twigs and branches that uphold them, and the trunk, which braves every storm, and stands all winters, is much paler, and not infrequently spotted with gray and brown.

While potash is thus generally diffused throughout plants, shrubs

and trees, soda—the other fixed alkali—is no less abundant in marine vegetable productions. The combustion of forest timber furnishes us with the first, the burning of seaweed with the last,—and in both cases the application of fire is the means, by which the chemist or manufacturer is supplied with these two invaluable articles. When we consider their common origin, it seems strange that potash should be known under the name of the VEGETABLE, and soda under that of the MINERAL alkali—these being the general and popular epithets which they are distinguished. To account for this, we have only to reflect that, although potash exists both in the primary and secondary strata, there are no common processes of art by which it is procurable from these sources, and the incineration of vegetables is the invariable method of obtaining it for the purposes of commerce—whereas on the contrary, although soda is contained in all marine plants, and is offered under the form of kelp and barilla, it is met with as a mineral in several quarters of the world. In Egypt, on the plains of the Delta, it is found in large quantities, and exported under the name of natron. It occurs likewise native in the *East Indies, and in the islands of Sicily and Teneriffe. It is abundant in China, Persia, and in the environs of Smyrna and Tripoli; so that soda for the uses of life, can actually be derived from the mineral kingdom. Viewed however as a manure, it can only be employed by the farmer in the shape of seaweed; and indeed both potash and soda are by far too expensive, after they are separated and refined by artificial processes, to be used as fertilizers of the soil.

It is reasonable to conclude, that both the alkalies serve the same end in the organization of plants. These two substances are allied to each other in their chemical properties, and although easily distinguishable, they agree in giving solubility to oils and fats, and in operating on colors. These powers they exert more forcibly in their caustic than in their mild state—for like lime and magnesia, the two earths on which we have bestowed some attention, they may be considered, both when pure and in combination with carbonic acid, as fossil manures.

But though we should thus stop short in the further illustration of the alkalies themselves, we cannot, without doing signal injustice to the subject, withdraw from the consideration of the many compounds formed by them with the mineral acids—several of which are admitted to accelerate and increase the work of vegetation. These compounds are better known under the name of neutral salts; and so strong is the tendency of the alkalies to these combinations, that they unite with almost all the acids, and form a vast family of salien substances of marked and peculiar character. These, by our earlier writers on the rural art, were dignified with the title of "†prolific salts and spirituous particles, without which the earth could produce

* Parkes' Chemical Essays, vol. 3, 157.

† Miller's Dictionary, under the article, "Earth."

no manner of plant or herb." Abstracted from these, it was contemplated as a lifeless inanimate mass, altogether unfit for the purposes of growth ; and it was supposed to be endowed with vegetative powers, only in proportion to the quantity of nitrous or sulphurous matter with which it was stored. Nothing displays the triumphs of modern science more advantageously than the overthrow of such crude and ill-digested ideas. The whole class of neutral salts found in the soil act a very subordinate part in the economy of vegetable life ; and instead of affording the principal nourishment, are, some of them, positively injurious, and a few only essential to the development and exercise of the functions of plants. Many of them, it must be confessed, are contained in every well-cultivated soil, or incorporated with the common putrescible manures, or discovered in the vegetable structure ; but they never have been thought of such importance as to be applied in an insulated and separate form to the manuring of ground.

The philosophic agriculturist has watered plants with aqueous solutions of them, in order to mark their effects, has noted down whatever he saw remarkable in the course of his inquiry, has deduced from his observations certain inferences, and thus afford some light regarding the action of these bodies in the progress of vegetation. But all that has yet been detected in this field of research is more curious than useful, and calculated to dazzle and amuse the imagination with the extent and intricacy of the laws of matter as acting on the organs of life, far more than to enlighten and direct the farmer in his methods of cultivation. Nevertheless, the discoveries which have been made strongly attest that substances, which are the most opposite to each other in character and effects, enter the organized structure in a greater or less degree ; and that the fossil manures embrace a much wider range of bodies than at first we are apt to imagine. In this province where the science can hardly be said to have taken root, and where the division of labour has not proceeded so far as to afford the means and leisure of entering deeply into such studies, it would be unprofitable to expatiate at much length on all the alkaline salts, which have been accounted to possess the qualities of fertilization. And moreover, the discordance which prevails amongst the best informed, throws a shade of doubt and obscurity upon the results which have been offered for our acceptance, and renders us incredulous about the doctrines delivered on this head, however specious they may seem, or well supported. On these accounts, I shall confine myself to a few cursory remarks by way of illustration.

The vegetable fixed alkali combines with all the common acids, and forms the carbonate, the muriate, the sulphite, the phosphate and the nitrate of potash, besides one or two other salts more sparingly distributed in nature. Of these the carbonate, sulphate and nitrate only, are supposed to act favorably on vegetation ; and the first with more energy and effect than the other two. Indeed so powerful is the affinity of the vegetable alkali for carbonic acid or fixed air, that it is oftenest found in this state of combination, and so exists, both before

and after it is separated from the wood ashes whence it is commonly derived. The successful results therefore, which we have here experienced from the burning of our forests and from scattering the black coaly residue as manure on the surface, must be referred to the action of the potash regarded as a carbonate rather than as a pure and simple alkali; although at the same time it must be granted that it exerts more effectually in the caustic state all its distinctive properties affecting vegetable colours and giving solubility to oils. Both in pot and pearl ash it is mostly united to fixed air; and hence the use of quicklime, to attract and neutralize that acid gas, in the ordinary processes of the manufactory.

The sulphate of potash, according to the statements of Dr. Home, is beneficial as a manure. This salt may be formed by a direct combination of the sulphuric acid and the alkali; but it is of too little value in the arts to justify such an application and consumption of these substances, and certainly of much less in agriculture. If it is to be used at all by the farmer, it must be obtained on much cheaper terms; and accordingly it has been discovered in Ireland mixed with peat ashes, and in this way introduced into the soil. From the very nature of its constituent parts, and their abundance as well in the mineral as in the vegetable kingdoms, this saline body cannot be of rare occurrence, but must be present in most situations where tillage and culture have been regularly carried on. In analytical investigations of soil it is very often detected among the other alkaline compounds; and yet by *some its utility is very much questioned, and experiments cited to give a colour to their doubts.

The nitrate of potash or saltpetre—the name by which this substance commonly passes—is another of the fossil manures, upon which also there has been a good deal of cavilling. Sir Kenelm Digby states that he made barley grow very luxuriantly by watering it with a weak solution of this salt; but whether his results are correct or not, it bears too high a price in the market to come within the reach of the common farmer, with a view to increase the produce of his fields. An ounce of this and the same weight of sulphur dissolved in water are said to form a liquor for steeping seed wheat, which proves an infallible preventive of smut; but all agricultural nostrums of this kind must be received with caution, and will be found, if at all, only efficient in particular cases. Pickling with brine or urine and dusting with quicklime are attested by a surer and much longer experience.

When we pass from these salts, of which potash is the basis, to those compounded of soda and the mineral acids, we tread on equally insecure footing, and are beset with like difficulties. The sulphate of soda, or Glauber salt, has been recommended by some speculative writers as bestowing on some plants higher powers of action and growth; and an inference has been maintained that it must, in some shape or other, stimulate the vegetable, because it operates on the

*Naismith's Elements of Agriculture, page 78.

animal system. But reasonings of this kind are too vague to furnish the groundwork of any fixed conclusion. Although the two classes of organized beings are framed to approach each other in some points of resemblance; in others they are forever separated by impassable barriers. We cannot stand firm on positions which are only fortified by distant analogies, and these often little more than the baseless fabrics of an active imagination. To add to our misfortune, this and similar salts are too valuable for other purposes to be made the subjects of an extensive series of experiments in husbandry, and therefore some shade of perplexity and hesitation must always hang about the opinions we adopt respecting them. For a long time to come this assuredly will be the debateable ground of agriculture, into which the prudent farmer may occasionally look for amusement, but from which he will borrow but seldom his rules of practice. His business it cannot be to apply to the druggist for substances which, although of undeniable use in the MATERIA MEDICA, must be of dubious efficacy in his particular department. The scientific inquirer may occupy himself in tracing the effects of neutrosaline compounds on the stalks of mint growing in his closet, but the real farmer must deal in grosser and bulkier materials, and depend for the goodness of his crops on his composts and dung-cart.

Common salt, which according to most systems of chemistry is a muriate of soda, but according to the hypothesis of Sir H. Davy is a combination of the new metal sodium and of chlorine, may be ranked among the most important and plentiful of the saline manures; and yet the opinions of mankind with regard to its efficacy are far from being as one. Like all the other bodies belonging to this head of classification, it is positively detrimental when existing in excess, and this fact was not hidden from the ancients. In the Jewish story it is related that one of their kings, under the maddening influence of a momentary conquest, slew the inhabitants of Shechem, beat down the city, and "sewed it with salt" as the highest expression of his wrath.

The Roman writers make several allusions to the unfruitful properties of soil impregnated with it; and Pliny expressly states that land becomes sterile after being sprinkled with salt. In this Province it is also known that the breaking in of the tide on our diked marshes, unless the breach be speedily repaired, is of pernicious effect, and when a piece of this kind of land is first surrounded with a chain of embankments, to shut out the sea, it requires at least three years before its native principles of fertility are in their usual vigor. The predominance of salt is the popular cause ascribed for this temporary barrenness, and there are not wanting instances in the memoirs of English husbandry to prove that here we have in all likelihood hit on the truth. In the report of *Cheshire drawn up for the Board of Agriculture, the writer has meritoriously fixed his attention on the supposed effects arising from salt, because it is more abundant in this than in all the other counties of England; and has registered some circumstances

* Marshall's Review. Vol. 2. page 27, &c.

bearing on the same conclusion that is derivable from our experience. He has selected two facts which would seem to establish, that this substance, though applied in moderate quantity, is invariably attended at first with the destruction of vegetable life; but after the greater part of it has been dissolved by the rains, and has sunk into the soil, the remainder imparts a new energy to the roots of those grasses which it had previously well nigh killed. Time and the operation of the common elements of air and water thus change its character, and modify its effects. After draining, he says, some sour rushy land in October, refuse salt was spread on one part at the rate of eight, and on another of sixteen bushels per acre. In a short time, all vegetation vanished, and next April not a blade of grass was visible. But towards the end of May a rich verdure sprang up after the eight bushels, and in July a still richer after the sixteen; and to this day, though ten or twelve years have intervened, a superior luxuriance is the effect. Again he mentions, that a small quantity of foul salt was laid on a court pavement, to destroy the vegetation. Not a blade was to be seen the first year; but in the second, the grasses started up more vigorously than ever.

Though this barrenness grows out of an undue impregnation of the soil, if follows not, that salt is deleterious in minuter quantities. In accordance with this view of the matter, refuse salt by the Cheshire farmers is esteemed an excellent manure, either for pasture or fallows; but it should, they affirm, be first raised and incorporated with earth, roots, weeds, and other substances. Before 1768 the government allowed the refuse of the manufactories to be used for agricultural purposes; and the occupiers of land were in the practice of paying an officer to attend, while it was spread on the field or laid in compost. At that period a duty of four pence a bushel was imposed on it as a manure, nevertheless the demand continued with little abatement; and this serves to demonstrate better than the finest reasoning, what sense was entertained of its importance. In 1787, in consequence of the extent and number of the frauds committed on the revenue under the operation of the agricultural duty, the Act was repealed; and refuse salt was placed on the same footing as the merchantable. This blow was keenly felt at the time by the country, and since has been a frequent subject of murmuring and remonstrance. These complaints attracted the notice of the Legislature last year; and a *committee of the House of Commons was appointed to inquire into the laws relative to the duties, and to take examinations respecting its efficacy as a manure. It can now be obtained for agricultural uses at about £6 per ton.

In Aiton's report of the country of Ayr there is brought forward a collateral confirmation of the utility of salt on land. †Sea water is taken and evaporated, till the salt contained in it can be merely kept in

* Farmer's Magazine, vol. 19, page 416.

† General Report of Scotland, vol. 5, page 75.

solution. With this strong brine 32 bushels of lime shells are slaked and mixed to the consistence of soaper's waste. This quantity is either spread singly on an acre, or made into a compost with forty cart loads of peat earth; and this last method is accounted the preferable of the two. This new species of manure has stood the test of comparison with other kinds, and in no instance has fallen short of the most ardent expectations. It has been found peculiarly favourable to the growth of wheat and beans; and all corn crops, as well as the grasses which succeed, have been benefitted by it.

But the testimonies in favour of this saline body are not yet exhausted. In Cornwall the refuse salt of the fisheries is anxiously looked after by the neighbouring farmers, and has never failed to produce the most wonderful effects. This may be partially traced to the oil and entrails of the fish incorporated with it, which afford animal matter for decomposition; but only partially,—for it is beyond all doubt, from the nature and abundance of the evidence, that they are referable in part to the action of the salt.

At the brine pits of Droitwich, Worcestershire, where pan salt is manufactured, the refuse was there also sought after by the farmers, who preferred it to all other manures though charged with the agricultural duty; so that it is clear, from so many concurring suffrages in its behalf, that it has acted beneficially in these places.

There may be more difficulty in developing its mode of operation. That it is offensive to grubs and other vermin which pray on the crops, has, I believe, been fully proved; but it is more probable that its principal usefulness is dependent on its forming a component part of the organization, as do lime, plaister, and the alkalies. It is a substance very generally diffused throughout nature, exists in most soils, and is a frequent accompaniment of the animal and vegetable manures. In the usual processes of vegetation it must therefore be present, and it is only required by plants in very minute portions.

Notwithstanding the scruples still entertained about the efficacy of common salt, none of the other combinations of the alkalies and mineral acids can be so safely classed among the fossil manures. This arises probably from the vast plenty of this substance, and the opportunities thus afforded of subjecting it to experiment. Were our provincial farmers once satisfied of its value, the general lowness of the price here places it within their reach; as a hogshead containing eight bushels, which are sufficient for an acre, can be purchased at the proper season of importation at about 10s. or 12s. currency. Several of them have tried it and report favourably of the issue; so that our agriculture contributes its mite to strengthen the general conclusion.

We have now gone over the greater part of the neutrosaline bodies that are thought to accelerate and promote vegetation; and although much further discussion might be indulged in the same strain, we shall now hasten to the close of this letter by making one or two remarks.

First, it appears that the most of those salts are introduced into the soil and insinuate themselves into the structure of plants, without

any direct application of the husbandman. This is obviously the case with the alkalies, which are the bases of this whole class of substances. In what manner such an immense quantity of potash as is now appropriated to the vegetable creation and is diffused more or less among all the genera that belong to it, could have been separated and collected at first by the roots from the mass of mineral matter that goes to the formation of the soil, is a problem not easy of demonstration. It is much less difficult to explain the way in which marine bodies could have been furnished with the soda that they yield on burning. The fluid, with which they are constantly surrounded and in which they grow, holds it in solution; and though we have no proof that they have the power of extracting soda from common salt, yet there are artificial processes by which this can be accomplished, and the presumption arises that it can be effected also by the exercise of the vital organs. After the alkalies themselves have found admission into the vegetable kingdom, the compounds formed of them and the more common acids are easily accounted for; and the presence therefore of salts in the soil or in the organization is matter of no great mystery. The very approach of these simple bodies towards each other must end in the action of chemical affinities, and the laws of dead matter are fully powerful to cause the effects, without having recourse to the principle of vitality.

According to the mode in which farming is now conducted in every civilized part of the world, there can be no want of the fixed vegetable alkali for the growth of crops. Stable-dung, which is composed of corn, roots and fodder which have passed through the digestive process, and of straw that has been used for litter, must contain the quantity of potash which preexisted in the roots, stems and leaves that have been broken down, for the support and comfort of the working animals. The application of seaweed, likewise, as a manure, and the universal consumption of salt for all culinary purposes and for the preservation of meat, must have distributed soda very generally over the surface of every cultivated country; and thus an ample store of alkaline matter is provided for the organization of the successive crops which may be raised, to furnish the food of future generations. The neutral salts, too, will be formed according to the necessary calls of vegetation; and as rich harvests have been hitherto gathered without the necessity of any direct application of the alkalies or their compounds, we have just reason to infer that the fertility of the earth will be sustained without resorting to new or different means. On these grounds the investigations into which we have entered must be regarded as objects of philosophic curiosity, rather than of practical use, and the chief advantage to be drawn from them, is the insight they afford to the secret connection existing between inanimate and organized beings.

Further, it is extremely rational to suppose that all saline bodies will be deleterious, when in the rising sap they are dissolved in larger quantity than is needed for the perfect formation of the fibrous texture. This seems to be an universal law, alike applicable to the putrescent and mineral manures. If decomposable matter, whether vegetable or animal, be administered to the soil in excess, the corn crops will push

beyond the point of healthy expansion, run into straw, and show a tendency to lodge. The superabundance of lime and magnesia is equally pernicious; and we have shown above that salt, on its first application in any considerable quantity, has the effect of obliterating every trace of verdure. As the whole doctrine concerning the efficacy of saline matter is wrapped in much obscurity, it must be exceedingly dangerous to apply any of the salts in a direct form to the living roots. We are confessedly ignorant of the proportions in which they enter into the vegetable structure; and therefore all tampering with them in the present state of knowledge is like groping in the dark. *Sir H. Davy acknowledges that he tried a series of experiments on them in the May and June of 1807; and he found that in all cases when the quantity of the salt equalled one-thirtieth part of the weight of water, the effects were injurious; and even after he had diluted them to one three-hundredth part of the water, some had no visible operation and others disappointed his hopes.

The legitimate inference warranted by this full and impartial survey of the subject will lead us to deny the proposition of the earlier rural writers, "that the salts are the sole principles of fertility," and to pause before we carry into our fields, with a view to their renovation, substances which though admitted to be essential to plants, require such accurate proportions and delicate handling. The practical agriculturist will follow a safer course in being satisfied with that quantity of saline matter which exists in his putrescible manures, as it is there skillfully compounded by that Divine Chemist who adjusts all his natural operations by the nicest results of measure and weight.

These two last letters, numbers 30 and 31, which are here inserted in their proper place, were never published in the newspapers. The discussion of the saline fossil manures had few charms for ordinary readers; a taste for scientific inquiry had scarcely begun to dawn in the Province; my former elucidations of chemistry in connexion with farming had been little read and less admired; and for these reasons I deemed it wise to suppress at the time disquisitions which had too much the air of learning, and were not quite essential to the comprehension of the other parts. But I left a gap, to be afterwards filled up, because otherwise the view I meant to give of manures would have been imperfect. On the republication of these letters in a more permanent form, the deficiency is attempted to be supplied; and though the subject matter may prove of little or no benefit to the majority of the agricultural body, yet I trust it will not be underrated by such as are desirous of exalting their profession, and of enlightening practice by science. To depreciate this sort of knowledge is paying a poor compliment to the understanding; and even admitting that the whole business of a farm without it can be correctly managed, it should be remembered that investigations of this nature have suggested and improved those very rules of practice by which husbandry has been carried on to so great a perfection.

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*Agricultural Chemistry, 34.

No. 32.

IN several of my former letters I have taken occasion to remark some striking and peculiar analogies which run through the animal and vegetable kingdoms; and to demonstrate that although these be separated by a distinct line of demarcation, the principles of life exhibit themselves in both, by the operation of the same general laws and by the union of consentaneous phenomena. Vegetables are the first step, in the ascending series of existence, by which inert and unformed matter is caused to assume living functions, and to obey a new order of impulses. They may be considered as the incipient forms of existence, by which the elements of the material world begin to be elaborated and prepared for sensation and perception; and in them we behold the dawnings of that future life, which is on the increase among the irrational tribes as they arise above each other in a more perfect and complex organization, till it blaze forth in the splendour of human intelligence. There is a slow and regular progression throughout the whole chain; and although the two extremes are widely apart, the intermediate links in apposition are closely connected and not distinguishable by any remarkable disparity. The general resemblance between plants and animals is so much matter of observation as to have commanded the attention and prompted the inquiry of philosophers; and the whole sexual system of Linnaus is built on the supposition that plants have distinctive organs of generation, and may be classified be enumerating these parts of their structure. It is now admitted on all hands that the two kingdoms possess certain characters in common which are indicative of life and without which it cannot be supported. These characters are inherited by all organized beings, are inseparable from their nature, and follow them through all their gradations. Without descending to any laboured or refined particulars, it may be observed that both vegetables and animals have an organic and vascular system, fitted for the performance of functions essential to their health and vigour; that they have a progress, maturity and decay; that they propagate their kinds by the same mysterious impulse; and that the individuals of both kingdoms enlarge their bulk, and are maintained through all the periods of their growth by the consumption of food.

When we search with a scientific curiosity more deeply into any of these points, and compare all the circumstances which may be supposed in any degree related to each other, the resemblance comes out with a new force and beauty, and we are constrained to allow, from the fulness and strength of the evidence, that throughout the whole circle of organized being is manifested a surprising unity of design. The food of all animals, for example, enters by a mouth, passes through an alimentary tube, is subjected to a variety of changes, gives out its nutritious particles, and is ultimately expelled. The food of plants, in like manner, is taken in by the absorbent roots, mingles

with the sap, rises through tubes constructed for the purpose to the remotest extremities, undergoes changes in the secretory organs, and is transpired, the excrementitious parts at least, through the leaves. The elements of food, too, in both kingdoms are remarkably similar. It is on this account that vegetables sustain animal life, and that dead carcases possess a fertilizing virtue. The preparation even of the aliment discloses fresh proofs of an intimate and near analogy. When the food is received into the stomach, its fibrous texture is dissolved by the action of the gastric juice. In this state it passes into the digestive canal, winds through all its curvatures, and the chylous matter, after being separated, is poured into the current of circulating blood. Before entering the stomach, the food undergoes certain processes of a preparatory nature. Besides mastication by the teeth, and mixture with the saliva, its texture is softened and sometimes dissolved by the application of fire. Hence the culinary arts of roasting and boiling, of stewing and steaming, which are all contrivances for the ultimate and more easy reduction of the food into its elementary principles. An analogous plan is pursued by nature and perfected by art, for the preparation of vegetable nutriment. The putrescent matter lodged in the soil is instantly acted upon by chemical laws, and hastens into a state of fermentation. The nutrient principles thus set at liberty enter into union with the sap, and mount through the alimentary tube of the vegetable. The action of fire too has been found of infinite service, and has been resorted to as a preliminary step, to assist the powers of decomposition. It is to this that the efficacy of paring and burning must be ascribed. The strong heat applied to the surface dissolves the nutriment of the future crop, and enables the roots to absord it more easily. The forest is cut down and consumed to ashes for the same purpose. It is by fire that lime is rendered useful; and clay, latterly, has been subjected to the same process of calcination, and been extolled as an active and powerful manure. To the illustration of this last subject I shall devote the present letter, and wind up the whole theory of manures, whether of animal, vegetable or mineral origin, with some concluding observations.

The practice of burning clay into ashes was revived in Great Britain about seven years ago, and made so much noise at the time as to attract the notice, not of farmers only, but of all classes in general. Its effects on the first trials were so extraordinary as to give rise to the most unfounded and immoderate hopes; and all men held the discovery as the beginning of a new era in agricultural improvement. The publications of the day were loud and warm in its praise, and the process, in its most minute parts, was detailed with an exactness commensurate to its supposed benefit and value. When the mind of the public, however, had descended from the aerial height to which it had, in the first transport of joy, been exalted, and when inquiry was set on foot to investigate the nature and effects of burnt clay, it turned out that this new practice, as it was called, had existed in England at a remote period, and that some old men then living recollected it as an

ordinary operation in their youth. The ashes had been spread as a top-dressing with remarkable effect, and had been used for all kinds of white and green crops. In a volume printed in London, in the year 1782, and named The Country Gentlemen's Companion, it is stated that the Earl of Halifax was the inventor of this useful improvement, and that it was much practised in Sussex. In the same work are the engravings of two kilns for burning clay, the one adopted in England, and the other in Scotland; and although all accounts agreed that it had answered better than either lime or dung for lands reduced to poverty by repeated cropping, it fell into disuse, notwithstanding this acknowledged excellence, because accounted too expensive. So entirely had the burning of clay been abandoned during that long interval that when it was introduced into general notice in 1815, the practical farmers—eminent for enterprise and science—deemed it an invention, accepted all the details with an enthusiastic ardour inspired by their novelty and importance.

It would appear, however, that even at that early period some improvements had been made in burning it, and that the expense was considerably reduced, because it is again mentioned in the Hertfordshire Husbandman—another ancient book of agriculture—as a cheap dressing, admirably adapted to all sorts of land and situations, and particularly fitted to be laid about the roots of young and old fruit trees, by which to enlarge, multiply and accelerate their products. The very process of ignition described as of ancient use is the same as that now universally adopted; and it is suprising to note how the mind of man when roused to accomplish any object falls at all times and in all places nearly on the same plans. It then cost about a half-penny a single bushel; and forty of them sown on an acre by the hand, and harrowed in with barley and grass seeds, were declared to be highly serviceable.

Although the practice, during the whole intervening period, had been relinquished in England, and almost forgotten in Scotland, it was preserved in Ireland, not universally, but in several counties. There it had obtained so firm a footing, and been felt so highly beneficial, that the ashes were preferred to lime, of which there is an exhaustless abundance in that kingdom. They were spread on land prepared for wheat, and corn of every description, as well as for flax and potatoes; and all the crops were luxuriant beyond credibility, even although growing on stiff, infertile soils. Mr. A. Craig, who had occasion to go repeatedly to Ireland, and to transact business there with the tenants on Mr. Murray's estate, was struck with this singularity in their husbandry; and his attention was strongly arrested by the method they adopted of burning the clay, just as it was dug out of the ground, and without preparation of any sort. On his return to Galloway he bethought himself of introducing among his own countrymen a practice, which promised to be attended with such invaluable results; and in 1812 he set about erecting a kiln after the model of those he had seen and admired. At first, he experienced some difficulty in finding clay, but he at length alighted upon a vein of tenacious subsoil,

partly till and partly clay; and although it did not altogether meet his satisfaction as to quality, he commenced operations, and persevered in burning it for three or four years, with the greatest success. He applied the ashes to the production of turnips, and these, under the influence of this new species of manure, exceeded all the same crops in his own neighborhood. Such was their luxuriance, that he even saw none superior to his own in any part of England; although he had twice travelled to London in that year. Having been thus convinced of the efficacy of clay ashes for turnips, he conceived himself called upon no longer to confine his knowledge within the limits of a sordid selfishness; and accordingly, in January, 1815, he communicated his discovery and success to Mr. E. Boyd, who both inserted the letter in the county newspaper and transmitted a copy of it to the secretary of the Wigton Agricultural Society. In the following May, all the documents regarding the wonderful effects of these ashes, appeared in the *Quarterly Number of the Farmer's Magazine, and by this means were diffused throughout the whole United Kingdom. The sensation at first felt was so sudden and unexpected, that it propagated through all the agricultural classes with the rapidity and quickness of electricity; and the burning of clay, with all the enlivening prospects it opened, was the theme of universal conversation, and swallowed up every other interest. In the course of that year it was commenced in many parts of Scotland, and found its way into England. Distinguished farmers subjected the ashes to a course of experiment; spread them on all sorts of crops; applied them to light and heavy soils; and manured the same field, partly with them and partly with stable dung, by which to estimate and remark their comparative effects. The result of the whole was favorable; and although, in some instances, it failed from the mechanical inaptitude of the soil, burned clay took its station among the fossil manures, and received the sanction and support of many scientific cultivators.

The fame of this new discovery suddenly passed from England to America, and in the year 1819, Mr. Merriot, near Hudson, who had received the account from an English Quaker, began to prove its utility. The mode of preparing this manure was described in the New Jersey Journal; various farmers tried it in different States of the Union; and this new improvement was naturalized and established on this side of the Atlantic.

Although this manure be substituted for lime, and even preferred to it in Ireland, where it seems to have been long in use it appears not to have the same qualities, nor to act in the same way as that invigorating fossil. In many important particulars the two differ widely, and only agree in their productive effects. It is not necessary, for instance, to apply clay immediately to the soil, as it comes from the kiln; for it may lie for months exposed to every variety of weather, without sustaining the least injury. Its chemical properties undergo

* From that Magazine, I have borrowed the most of these facts.

no change, like those of lime, from the action of the surrounding elements; and after being prepared, at the convenience of the farmer at any season of the year, it may be safely stored up for future use. The quantity per acre, which has been hitherto found effectual, is about twenty cubical yards, or from forty to fifty cart loads; and these vary, on an average, from 4 1-2d. to 6d. each, in price. This forms, therefore, the cheapest of all manures, which has yet been tried; and if half of the eulogies bestowed on it be just, it bids fair to become a very valuable and general article in every improved system of farming.

Pure clay is on all hands allowed to be the best substance to undergo the action of fire; but if of difficult acquisition, any firm, stiff, adhesive subsoil, composed partly of sand and clay, will answer the purpose of the operator. A Mr. Wallace, who rents a farm only one mile and a half from Kirkcudbright, and could obtain only a stiff subsoil, set to work in May, 1814, and before the sowing of turnips, had burned as many ashes as manured twenty acres. So rapturous is he in their praise, and withal so convinced of their superior efficacy, that he extols them above all measures; and declares that he would not be at the trouble of carting dung for his farm from the town, although it were given him in a present. This gentleman applied forty-five loads to the acre, and in the following year prosecuted his operations with such vigor, as to have sixty acres of turnips from ashes. The excellence of his green crop was such that he obtained the second prize from the Agricultural Society in the stewartry; and he announces with an air of confident exultation, that this discovery will extend the drill system far beyond the hopes of the most sanguine speculator. Indeed, clay ashes are spoken of with a kind of glowing enthusiasm, and all anticipate from their adoption the happiest results. It is folly, however, to expect that they will turn out a complete substitute for putrescent manure, as they can only act, like other fossil matter, either in altering and amending the contexture of the soil, or in slightly contributing to the vegetable organization. They cannot afford to the feeding fibres gum, sugar, mucilage and analogous productions, nor even the elementary bodies of which these are composed; for which reason *clay burning, in the end, may be expected to turn out much less efficacious than these reports would lead us to anticipate. Animal and vegetable

*I observe that General Beatson, late Governor of St. Helena, has appeared before the British public with an entirely new system of Agriculture, founded on the effects of burning clay or soil. This writer discards the use of dung and lime, and effects to raise an endless succession of crops by burning the surface of his fields by means of stubble or other combustible matter, and by more thoroughly pulverizing the ground with the aid of a new cultivator or grubber which he has invented. The peculiar principle of its make lies in the power of increasing or diminishing the number of iron teeth or tines at work, and of sinking them at greater or less depth into the ground. This instrument may be advantageous on well cultivated soils; and probably will be adopted as part of agricultural machinery; but his system of pulverization and burnt soil, taken generally, is so much at variance with the results of past experience, and saps so completely the whole foundations of chemical knowledge, that in my apprehension it will only enjoy a momentary fame. If he is right, the world has been long blundering in error. Paring and burning have always at first produced surprising effects, but if long persisted in, they have never failed to establish the common axiom, "That the remedy often proves worse than the disease."

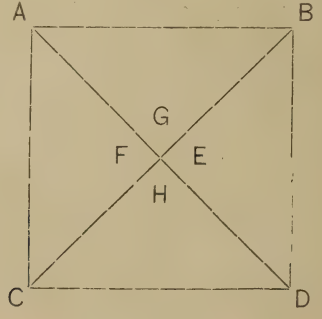
substances, as connected with the principles of fertilization, have stood the trial of more than twenty centuries, and we must be extremely wary in expelling them from that useful station which they have so long and so justly filled.

There have several modes been fallen upon, by which to burn this manure, and as might be foreseen, with various success. Sods, pared from the surface, have been exposed some time and dried in the sun, to render them more combustible. A layer of these has been spread on the ground, and strewed over with quicklime drawn immediately from the kiln; another layer of dry turf has been applied, and that again intermixed with an additional quantity of lime, and the whole then closed up with sods. In twenty-four hours this heap will take fire and burn with great intensity, by the mere evolution of latent caloric. The clay should then be applied to the sides and on the top, and as the fire extends and breaks out, new quantities should be laid on till enough is prepared.

Another method, which has been adopted in England, is to burn the clay by means of a draw kiln; and in this case the process exactly resembles the calcination of lime; but neither of these plans have come into general estimation, and they are, in truth, accompanied with many inconveniences.

The most approved mode is that which is borrowed from the Irish practice, and which, for the instruction of my readers, I shall attempt to delineate. It is in vain to expect that any written account will convey a full and satisfactory idea of the work; but as nothing of the kind is going on in the Province, and as therefore we are shutout from the benefit of ocular inspection, no other way is left to inform the public.

The general method of proceeding is to form on the field where the clay or other subsoil is attainable, an oblong enclosure, varying in size according to the quantity designed to be burned. The dimensions of a moderate kiln may be quoted about fifteen feet long by ten wide; and the walls should be raised of green turf to the height of $3\frac{1}{2}$ or 4 feet. Within this enclosure, air pipes should be constructed of two parallel lines of sod set on edge; and the space between them should not be wider than a turf of ordinary bulk can easily cover. The direction of these pipes should be from corner to corner, and they should intersect each other diagonally, each of them having an opening on the outside of the wall to the external air.



Thus: A, B, C, D, are the four openings of the kiln at the corners; AD and BC are two lines of pipes built on the ground and made hollow for the admission of air.

In each of the four spaces marked on the plan, e, f, g, h, a fire is lighted with wood and dry turf; and so soon as it begins to burn, more fuel is thrown in, till the bottom of the kiln is in flames. The clay should then be laid on in small quantities at first, and repeated as often as necessary; and this must be regulated by the force of the heat. The air pipes, at the commencement of the operation are of infinite service, because by them a current of air is constantly rushing in and blowing on the fire kindled at their junction; but it is not long till they are reduced to ashes. As the internal space fills up with clay, the outer wall will be raised in height, always taking care to have it at least 15 inches higher than the burning heap, that the wind may not act on its surface. Should the flame at any time threaten to break through the wall, the breach must be instantly repaired; and if that be impracticable, another sod wall opposite to it must be constructed from the very foundation. By this means the kiln may be extended to any bounds; and after the original walls are all burned through, the fire may still be confined by the erection of new ones. This however is not advisable, as when the dimensions are much increased, the workmen, in the act of feeding with clay, are forced to walk on the top, and thus to press down the materials—which circumstance retards the rapidity of the ignition. The principal secret of the whole operation consists in having the wall made quite close and impervious to the external air, and in giving attention to having the top always lightly but completely covered with clay. Whenever the fire is suffered to break through the sides or flame out of the top, the kiln is very soon extinguished. A person, therefore, must be in waiting, both day and night, to repair the breaches; and to feed regularly with clay. At the commencement, the spits thrown upon the fire should be small, and dried in the sun a day or two beforehand; but after the kiln has gathered force, the clay may be applied quite wet as it is dug from the pit, and in as large pieces as the spade can lift. No wood, turf, or any combustibles are necessary after the operation is set a going; and the vicissitudes of the weather have no perceptible effect.

There is one error into which every inexperienced operator runs, and which ought to be guarded against with studious care. During the whole process, and while the fire is burning with the utmost intensity, no flame is ever visible, and but seldom any smoke—a thing which is apt to deceive strangers; and should they, from impatience or a wish to stir the latent embers, lay open the kiln either at the sides or top, they incur the certain danger of extinguishing it altogether. The exclusion of the external air, except in the first instance to light the combustible matter, is indispensable to the success of the whole plan; and the effectual way to stop the burning, when a sufficient quantity is prepared, is by facilitating the escape of the heat and flame.

The prosperous issue of burnt clay, in many districts of the old country, has been so unparalleled, that it is worth while to make a trial of it in this. In a kiln 100 loads can be easily managed; and the whole expense will not exceed ten dollars, giving a liberal allowance for labour; and in many of our settlements where wood is cheap, will not even rise to that sum. I should conceive, that in Annapolis, where calcareous earth in none of its ordinary forms has been discovered, a series of experiments might be instituted with advantage; and if the ashes be endowed with that extraordinary fertility which has been ascribed to them, the fact will come before the public through the medium of the society now established there. I press this the more on the attention of the gentlemen in that quarter, because they have abundance of the adhesive subsoil, which is well fitted for the operation; and if the ashes have been used elsewhere in preference to lime, this new manure may shed on that county the same benign and extensive influence, which the other will effect in the rest of the province.

After having written so much on the general doctrine of manures, it is high time to draw towards a conclusion; and yet, notwithstanding the length of the enquiry, there are some points on which our attention has not been settled. The ashes of pitcoal, which are to be procured abundantly in Halifax or in Picton from the preference given by the inhabitants to this species of fuel, have long been recognized as eminently useful. For turnips they serve an excellent purpose, by encouraging a quick growth and hastening the tender plants beyond the ravages of the fly—an insect as well known here, though not so destructive, as in England. There is some difficulty in referring this description of dressing to its proper place in the system of classification; for though it is extracted from the bowels of the earth, and constitutes one of the secondary formations in the mineral kingdom, it is pretty generally believed by our later naturalists to be of vegetable origin. The whole of Dr. Rennie's reasoning in his fifth essay on the alliance between peat and coal is framed to establish, that the *swamp and peat bogs of a primeval age have been overwhelmed and buried under the successive strata that now lie above them, and that they have, in this new situation, been converted into that black and brittle substance which we now use as fuel. Should we accept without further investigation this account of their descent, the ashes which they yield on burning must be classed amongst the decomposable manures.

Neither has anything been advanced on the expediency of ploughing in green crops to enrich the soil. This is a practice which prevails to some extent in England, and was quite common in the Roman husbandry. Since however the introduction of the alternate rotation, and the means it affords to every occupier of land for the maintenance of a suitable stock of cattle, there is hardly any necessity for such a wasteful expenditure of the fruits of the earth; because the

*Rennie on peat moss, page 374.

crop can be consumed in the raising and fatting of meat, and in this way will nearly yield the same quantity of putrescible manure. That turning the crop under furrow has proved efficacious in many trials cannot be doubted; but I fear, it is a departure from the sounder maxims of a judicious economy. Rape, tares, buckwheat, lentils, or any other succulent green crops have all in their turn been used, and are alike answerable for this end. But it is not my design to stop now for any discussion of this nature; because the principles already laid down and fully illustrated can be readily extended to this new species of dressing, and its mode of action easily ascertained. The remainder of this letter will be much better occupied in tracing the relations subsisting between the two great orders of fertilizing matter—the fossil and putrescent—that we may if possible discover some connecting link by which to account for their analogous effect, and the conversion of both to the use and support of the vegetable world.

It is demonstrable that the elements of all the manures are derived from the mineral kingdom as their primary source. When the eye, under the direction of an intelligent mind, sweeps across the visible objects of creation, they appear to be divided by peculiar and distinguishing characters into three classes or orders—the mineral, the vegetable and the animal. Under the first are comprehended all the forms of inert matter, and which are subjected to the different mechanical forces of impulse, gravity and cohesive attraction. These forms revolve around a circle of unceasing change, as they are acted upon by chemical laws, by electricity and the repulsive energy of heat. Sometimes they are presented to us as simple elements, and at others as compound aggregates in which the former are mixed up in various proportions. They constitute the materials of which this globe is composed—the land, the sea and the atmosphere—and they embrace solids, fluids and gases; acids and alkalies; earths and metals—in short, all the inorganic substances. These, in the largest sense of the word, are classed under the head of the mineral kingdom.

The second order of objects which strike the senses is raised a little higher than the other in the scale of existence. Among these for the first time we meet with contrivances by which to preserve the individual and reproduce the kind. Their structure is complex, displaying a system of vessels and of parts adapted for particular uses. Here we contemplate the phenomena of fructification, of regular growth and decay, and of dependence on the great powers of nature, as the sun, rain, dews and the seasons. The changes which occur are not the result of mechanical and chemical laws alone, but these are modified and controlled by some higher and superior principle, which escapes from the retort of the experimenter and cannot be recalled by the utmost efforts of his art. This principle is vegetable life, which regulates and presides over all the products elaborated in the process of growth. But with the single exception of this living principle, there is nothing found in plants which cannot be easily traced to the order

of minerals. Oxygene, hydrogene, carbon and azote—the four great elements of the vegetable compounds—can obviously be drawn from this source, as they exist abundantly in earth, water or air. The common acids, the alkalies, or the salts formed of them—sulphur and phosphorous—sand, clay, lime, magnesia—iron and manganese, are substances which can be extracted from the primary or secondary formation of this globe, and must therefore be regarded as members of the mineral families. In short, the material parts of herbs, shrubs and trees are neither more nor less than aggregations and arrangements of the forms of matter, which were dead and inert till they were appropriated to this loftier use, and animated by the quickening impulse of vitality. Accordingly, when the living principle is extinguished either by violence done to the organization, by the approach of winter, or by natural decay, the fibrous texture and all the products contained in it yield on ultimate analysis substances of mineral origin. The same remark may be extended to the class of animals, as they also on being decomposed produce the dead elementary forms of matter.

Again I observe, that plants have the power of assimilating to themselves these elementary forms, and clothing them with the attributes of life. The organizable matter which now is incorporated so plentifully with the surface of our globe, and which originated in the decay and dissolution of the past races of vegetables and animals, must at one period have existed in a free state, confounded and lost among the other minerals of the universe. During past ages it has been constantly accumulating, and is the only remnant of former generations. Unless plants had the power of elaborating from the elements of things these peculiar products which go to the composition of their own parts, they could not preserve their existence in a natural state, where they are debarred all access to artificial manure. But we do not need to reason hypothetically on this subject, as this their capacity is matter of observation, and occasionally happens under our sight. We can all recollect some instances where the surface mould has been removed, and the subsoil left exposed to the atmosphere; or we may have seen deep excavations made in the side of a mountain which brought strata to light, that could not possibly have been mixed with vegetable or animal remains. At first, the grasses refuse to vegetate in situations which are necessarily devoid of all putrescent nutriment; but the lichens readily take up their abode in them, and gather their subsistence from air and water. These perish on the surface and form the first thin layer of decomposable matter. A new race succeeds and thrives more vigorously on the ruins of the old, till at length some of the grasses find a bed for their maintenance and growth. The vegetable mould now multiplies apace and becomes prepared for the reception of larger plants, till at last trees strike root, shed their annual leaves and thus thicken and enrich the soil. During all these changes no putrescent matter has been artificially supplied; for we have supposed human industry not to interfere with the results, but to leave the succession of plants to scramble for themselves among the principles of matter.

But we have positive evidence of this capacity in vegetables from the accumulation of peat mosses. In Germany, France and Britain these have been extensively dug during the last two hundred years for economical uses, and particularly for fuel; so that in many places the bottoms of them have been reached, and the surface which they covered laid bare. There traces of the plough are discovered, of trunks of trees lying prostrate, and the stumps still standing upright with their roots fastened in the ground. Such appearances are reconcilable only to one hypothesis—that peat is of vegetable origin, and has grown and increased since the time when the plough marked or the forest shaded the lower soil—and whence this mass of vegetable matter, unless we admit that the successive generations of aquatic plants seized on air, water and the other elements, and solidifled them into their own structure?

Every shade of doubt will be chased from this point, if we reflect on what constitutes the chief vegetable products. They are either ternary or quaternary compounds of carbon, oxygene and hydrogene, or of these and azote. Among the ternary combinations are ranked mucilage, starch, sugar, wax, resin, camphor, oil, and woody fibre; and among the quaternary which contains azote are comprehended albumen, gluten, gum elastic, extract, tannin, indigo, the narcotic and bitter principle. All the vegetable acids, too, with the exception of the prussic, that contains azote, are constituted by different proportions of carbon, hydrogene and oxygene; so that these four undecompounded bodies, which, according to the present state of chemical knowledge, must be considered as elements, are variously combined and consolidated into the organization. But they are capable of derivation from other sources than putrescend substances; and if we can only shew how plants may acquire them, independently of vegetable and animal remains, we shall have mastered the great difficulties of the question. This is among the simplest problems in agricultural chemistry. The atmosphere is composed of 79 parts of azote, and 21 oxygene gas, with a minute portion of carbonic acid; and besides it holds, according to the degree of heat, a greater or less quantity of aqueous vapour in an invisible state. Water, again, is constituted by two proportions of hydrogene and one oxygene—so that air and this fluid furnish all the elements of vegetable products, without having recourse at all to organized matter. The atmosphere can supply carbon, oxygene and azote by means of the leaves; and water can supply oxygene and hydrogene from the sap taken in by the roots. The soil, again, offers the alkalies—the earths—the metallic oxides of iron and manganese, and the other salide compounds found in plants—so that the whole catalogue of nutritious and alimentary substances can be made up from the mineral kingdom. This gives us a clear view of the station which is assigned to vegetables in the scale of existence. They are endowed with a living principle, by which to combine, consolidate and organize the inert and unformed particles of matter into products altogether distinct from those of chemical affinity, and which are destined for a new

and important use in the creation. These ternary combinations of vegetable life are susceptible of yielding nourishment to animals—a class of beings entirely dependent on them for subsistence. Unless plants had the power of arranging into compounds the inorganic particles of bodies, all the rational and irrational tribes must become extinct for want of food, as none of them could perform such functions, and none could subsist on the chemical aggregates of matter. This capacity, which we have ascribed to plants, is of prime and indispensable necessity in the order of being; and on it several phenomena depend which are of familiar illustration.

When a settler first goes into the woods to lay the foundation of future farm, he has no means of raising putrescible manure till he reaps his first harvest. The seeds which he carries thither and sews in the spring, burst and expand; lay hold on the elements of air and water, as well as on the substance in the soil; and fashion them all into new arrangements. With the straw of white and the leaves of green crops, he commences his dunghill; and if the contents are carefully collected and yearly applied, the gross produce advances at a certain rate of augmentation. Every succeeding season enables him to enlarge his putrescent manure; and this increase is accountable on no other principle than the power of plants to organize and appropriate to themselves those simple forms of matter, which are diffused throughout the mineral kingdom. The present barn manure at the command of the farmers of this vast continent bears no comparison to the insignificant quantity, which was found at the first discovery of the country; and as the forests are cut down, and the agricultural interest predominates, this surest source of fertility will swell and multiply in proportion. The carbon, hydrogene, oxygene and azote, which are so bountifully distributed throughout the material world, are perpetually arrested and formed into new combinations by the exercise of those organs that belong to plants.

Further, the increased productiveness ascribed to the ploughing in of green crops could have no meaning, but on the supposition of a greater increase of vegetable matter than was drawn from the soil; for it would be downright folly to use them as manure, if they only restored the exact quantity of alimentary food which they had extracted by means of the roots. But if they have been borrowing carbon and azote from the atmosphere, and oxygene and hydrogene from water, and can solidify these into the system, there is an accumulation and increase of organizable matter which on fair grounds can justify the theory of this operation.

Again, I observe that although manures have been divided into two classes, the mineral and putrescible, they both nourish the crops by yielding to them the same substances in different states of combination. The component parts of vegetable, as well as of animal bodies, as has been shown, derive their descent from the mineral kingdom, and are nothing save the elements of matter acted on, and modified by living powers. When life is gone, they submit to the process of dis-

solution, and become again blended with the mass of material things. In the first stage of putrefaction, however, their soluble compounds separate from the organization, without being reduced to their first principles; and hence mucilage, starch, sugar, tannin, extracts, and gluten, and likewise gelatine, albumen and other animal products pass unchanged into the structure by being dissolved in the sap. These afford, from their very nature, a stimulating and appropriate nourishment, because they have been previously elaborated by the vital principle into forms which go at once into the constitution of the fibrous structure. They cherish the plant most vigorously, and supply what justly may be styled an organized food; for they are all combinations of the vital energy, and nothing resembles them in the material world. The ingredients of their composition are arranged, not according to the laws of definite proposition, but on a new plan, and in a way inimitable by art. We can analyze these proximate principles of vegetable and animal existence, but we cannot reunite them by any synthetical process.

These illustrations will sufficiently explain the great difference which must subsist between a plant growing in a state of nature, and reared by the hand of cultivation. In the first case it has to collect the elements of its food from earth, air and water, and elaborate them prior to assimilation, whereas, when cultivated by man, the immediate principles of its growth and expansion are applied in the putrescent manures, and the sap takes up all the soluble matter and distributes it through the system. Hence the size to which the seeds of all grain have attained from the care and skill of the farmer; and hence the beauty, flavor and perfection of those fruits which are sour, small and unsightly on their native tree. It is the presence or absence of these organizable matters, which constitute a rich or a poor soil; and the luxuriance of the crop is in the exact ratio of the alimentary principles that are placed within the range of the roots.

But putrescent manures not only furnish those alimentary principles, such as gluten, mucilage, starch and sugar, but they afford also fossil bodies, which, as far as we know, exist in plants as in nature, exactly in the same state of chemical union. I allude to the earths, the alkalies, the oxides and the salts, which, in greater or smaller quantities, are necessary for forming the complete organization, and are therefore blended in the system. The excrementitious matters of all animals about a farm, and of course the dunghill, which consists of these and of straw used as litter, contain those mineral substances, probably in the minute portions which the wants of vegetation require; and hence the reason, why a direct application by the farmer of earthy or alkaline salts is either useless or deleterious. When these saline compounds are administered to a soil long under tillage, it is more than probable, that it already abounds with them from the putrescent manures formerly used, and that it would be injuriously overloaded with any additional quantity. But on such subjects it is our duty to speak with extreme diffidence, because much obscurity still hangs on

the functions of the vegetable economy; and perhaps the precise way, in which the Divinity conducts this part of his universal scheme of providence, will forever be hidden from our senses. The imperfection of our powers in tracing the various workings of the vital principle, from the first bursting of the germ to the maturity of the seed, is abundantly manifest; and were they not objects of daily occurrence, all the phenomena of growth would impress us with sentiments of admiration and astonishment. We know little more than a few isolated facts, on which with all the confidence of infallibility we build theories, and then defend them with unpardonable stubbornness.

Although we know not the exact quantities of the alkalies, oxides and salts which plants assimilate to themselves, and on that account cannot apply them with skill and in exact proportion, some philosophers have endeavoured, after much study and investigation, to enumerate the substances themselves, which they detected unaltered either in the sap or organization. Among these stand foremost the two fixed alkalies, and the four earths that constitute soil. The only metallic oxides found, and these in very minute traces, are those of iron and manganese; but the saline bodies are extremely numerous. We have in plants the carbonate, sulphate and phosphate of lime; common salt and the phosphate of potash; and various other compounds of the nitric, phosphoric, sulphuric, and muriatic acids with the alkalies and earths. In Saussure's Reasearches on Vegetation, tables are constructed of the mineral bodies which he detected in the ashes of different vegetables; and they are here subjoined, because in themselves curious, and illustrative of the doctrine of the fossil manures. These bodies were separated from the ashes after incineration, and appear to have suffered no change from having been submitted to the action of the vital energy, but to have existed as pure chemical compounds in the vegetable, as they did in the mineral kingdom.

	Ashes from 1000 parts of the plant green.	Ditto, dry.	Water from 1000 parts of the plant green.	Constituents of 100 parts of the ashes. Soluble Salts.	Earthy Phosphates.	Earthy Carbonates.	Silica.	Metallic Oxides.	Loss.
Leaves of the oak (quercus robur), May 10,	13	53	745	47	24	0,12	3	0,64	25,24
Ditto, Sept. 27,	24	55	549	17	18,25	23	14,5	1,75	25,5
Wood of a young oak, May 10,	..	4	..	26	28,6	12,25	0,12	1	32,58
Bark of ditto,	..	60	..	7	4,5	68,25	0,25	1,75	22,75
Entire wood of oak,	..	2	..	38,5	4,5	32	2	2,25	20,65
Alburnum of ditto,	..	..	..	32	24	14	7,5	2	23,5
Bark of ditto.	..	60	..	7	3	63	1,5	2	21,5
Cortical layers of ditto,	..	73	..	7	3,75	65.	0,5	1	22,75
Extract of wood of ditto,	..	61	..	51					
Soil from wood of ditto,	..	41	..	24	10,5	10	32	14	8,5
Extract from ditto.	..	111	..	66					
Leaves of the poplar (populus nigra) May 26	23	66	652	36	13	20	5	1.25	15,75
Ditto, Sept. 12.	41	93	565	26	7	35	11,5	1,5	18
Wood of ditto. Sept. 12,	..	8	26	..	16,75	27	3,3	1.5	24,5
Bark of ditto.	..	72	..	6	5,3	60	4	1,5	23,2
Leaves of hazel (corglus avallana), May 1.	..	61	..	26	23,3	22	2,5	1,5	24,7
Ditto, washed in cold water,	..	57	..	8,2	19,5	41,1	4	2	22,2
Leaves of ditto, June 22,	28	62	655	22,7	14	20	11,3	1,5	21,5
Ditto, Sept. 20,	31	70	557	11	12	36	22	2	17
Wood of ditto, May 1,	..	5	..	21.5	35	8	0.25	0,12	32,2
Bark of ditto,	..	62	..	12,5	5,5	54	0.25	1,75	26
Entire wood of mulberry (marus nigra, November,	..	7	..	21	2.25	56	0,12	0.25	20,38
Alburnum of ditto,	..	13	..	26	27,25	24	1	0,25	21,5
Bark of ditto,	..	89	..	7	8,5	45	15.25	1.12	23,13
Cortical layers of ditto,	..	88	..	10	16,5	48	0,12	1	24,38
Entire wood of hornbeam (carpinus betelus), November,	4	6	346	22	23	26	0,12	2,25	26,63
Alburnum of ditto,	4	7	390	18	36	15	1	1	29
Bark of ditto,	88	134	346	4,5	4,5	59	1,5	0,12	30,38
Wood of horse chestnut (aesculus hyp pacastanum) May 10,	..	35	.	9,5					
Leaves of ditto, May 10,	16	72	782	50					
Leaves of ditto, July 23,	29	84	652	24					
Ditto, Sept. 27,	31	86	630	13,5					
Flowers of ditto, May 10,	9	71	873	50					
Fruit of ditto, Oct. 5,	12	34	647	82	12	..	0,5	0,25	5,25
Plants of peas (pisum sativum) in flower,	..	95	..	49,8	17,25	6	2,3	1	24.65
Plants of peas (pisum sativum) in flower, ripe,	..	81	..	34,25	22	14	11	2,5	17,25
Plants of vetches (cicia fabia) before flowering, May 23,	16	150	895	55,5	14,5	3,5	1,5	0,5	24.50
Ditto in flower, June 23,	20	122	876	55,5	13,5	4,12	1,5	0.5	24,38
Ditto, ripe July 23,	..	66	..	50	17,75	4	1,75	0,5	26
Ditto, seeds separated,	..	115	..	42	5,75	36	1,75	1	12,9
Seeds of ditto,	..	33	..	69,28	27,92	..	..	0,5	2,3
Ditto in flower, raised in distilled water,	..	39	..	60,1	30	..	..	0,5	9,4
Solydago vulgaris, before flowering, May 1.	..	92	..	67,5	10,75	1,5	1.5	0,75	18,25
Ditto, just in flower. July 15,	..	57	..	59	59	1,5	1,5	0,75	21
Ditto. seeds ripe, Sept. 20,	..	50	..	48	11	17,25	3,5	1,5	18,75
Plants of turnsol (helianthus annuus), a month before flowering, June 23,	..	147	..	63	67	11,56	1,5	0,12	16,67
Ditto in flower, July 23.	13	137	877	61	6	12,5	1,5	0,12	18,78

	Ashes from 1000 parts of the plant green.	Ditto, dry.	Water from 1000 parts of the plant green.	Constituents of 100 parts of the ashes. Soluble Salts.	Earthy Phosphates.	Earthy Carbonates.	Silica.	Metallic Oxides.	Loss.
Ditto, bearing ripe seeds, Sept. 20	23	93	753	5.15	22,5	4	3,75	0.5	17,75
Wheat (triticum salivum), in flower,	..	..	..	43,25	12,75	0.25	32	0.5	12.25
Ditto, seeds ripe,	..	..	..	11	15	0,25	51	1	18,75
Ditto, a month before flowering,	..	79	..	60	11,5	0,25	12,5	0.25	15.5
Ditto, in flower, June 14,	16	54	699	41	10.75	0,25	26	0.5	21,5
Ditto, seeds ripe,	..	33	..	10	11,75	0,25	51	0.75	23
Straw of wheat,	..	43	..	22,5	6,2	1	61,5	1	78
Seeds of ditto,	..	13	..	47,16	54,5	.	0,5	0,25	7,6
Bran,	..	52	..	4,16	46,5	..	0.5	0,25	8,6
Plants of maize (zea mays), a month before flowering, June 23,	..	122	..	69	5.75	0,25	7.5	0.25	17,25
Ditto, in flower, July, 23,	..	81	..	69	6	0,25	7,5	0,25	17
Ditto, seeds ripe,	..	46							
Stalks of ditto,	..	84	..	72,45	5	1	18	0,5	3,05
Spikes of ditto,	..	16							
Seeds of ditto,	..	10	.	62	36	..	1	0.12	0,88
Chaff of barley (hordeum vulgare),	..	42	..	20	7.75	12,5	57	0,5	2,25
Seeds of ditto,	..	18	..	29	32,5	..	35.5	0.25	2.8
Ditto,	..	..	..	22	22	..	21	0.12	29,88
Oats,	..	31	..	1	24	..	60	0.25	14,75
Leaves of rhodadendron ferrugineum, raised on Jura, a limestone mountain, June 20,	..	30	..	23	14	13.25	0.75	3,25	15,63
Leaves of rhododendron ferrugeneum, raised on Breven, a granitic mountain, June 27	..	25	..	21,1	16,75	16,75	2	5.77	31,52
Branches of ditto, June 20,	..	8	..	22,5	10	39	0.5	5,4	22,48
Spikes of ditto, June 27,	..	8	..	24	11,5	29	1	11	24,5
Leaves of fir (pinui abies), raised on Jura, June 20.	..	29	..	16	12,27	43,5	2.5	1.6	24.13
Ditto, raised on Breven, June 27,	..	29	..	15	12	29	19	5,5	19,5
Branches of pine, June 20,	..	15	..	15					
Whortleberry, (vaccinium myrtillus), raised on Jura, Aug. 29,	..	26	..	17	18	42	0,5	3.12	19,38
Ditto, raised on Breven,	..	22	..	24	22	22	5	9,5	17,5

There is still a further conclusion to be deduced from the views which have been presented relative to the two classes of manures. And it is this: that although both the putrescent and the mineral contribute, in a greater or less degree, towards the vegetable organization, yet the latter serve other purposes than merely yielding a supply of nutrimental matter. In strict propriety of speech, perhaps, neither the earths, the oxides, nor the salts ought to be considered as the food of plants, because though they, and their compounds, constitute likewise part of the human frame, and enter the stomach along with other alimentary substances, yet they have never been classed, in the structure of any dead or living language, among the articles of subsistence. Our race are supported by animals, vegetables, or products from these; and whatever we style food, belongs to one or other of them; nevertheless we know that several chemical substances of fossil origin are employed in the curing of meat, in cookery and in medicine. But this when applied to plants may be regarded rather as a verbal than a real distinction, for if we contemplate the question in the light of philosophy, every thing may be called BABULUM or FOOD which goes to the composition of an organized being.

But granting this concession in its fullest latitude, we must not imagine that the farmer, in his application of fossil matter, is as much providing a store of aliment for his crops as when carrying to his fields the contents of his dunghill. In this latter case, he is literally preparing the banquet for the feeding fibres; in the other, his practice is guided by totally opposite views. When clay is carted on sand, or sand on clay, the object is not to furnish the small quantity of these earths which ascend into the plants, but to correct the mechanical texture of the soil with respect to moisture. When again lime, marl or magnesia are employed, it is done with a view to neutralize and destroy pernicious salts, to increase the absorbent power of the surface, or to subdivide and break down whatever is hard, stiff or tenacious. The putrescent manures, therefore, are strictly and properly the food of vegetation as supplying either the ternary or quarternary products which are the previous results of a vital principle, or their component elements of carbon, hydrogene, oxygene and azote; the fossil, on the other hand, enter in a very partial manner into the system; and though no chemical substances have been lifted to the rank of manures, which have not been found in the organization, yet their agency must be referred more to other causes, such as being offensive to grubs and insects, altering the mechanical texture of the soil and its relation to atmospheric absorption, or rendering it less or more retentive of water.

We are now ready to sum up the whole theory of manures in a few words. It is abundantly clear that the two classes into which they have been usually distinguished come from the mineral kingdom as their primary source; that plants have the power of seizing the inert forms of matter and assimilating them into their own substance; that animals are fed and sustained by the approximate principles of this assimilation; and that plants and animals after death are resolvable

into products, which nourish crops more vigorously than those inert forms. The putrescible manures, therefore, are compounds elaborated by the vital principles—the fossil are compounds of mere chemical affinity, and serve other purposes than that of food in the economy of vegetation.

Such are the inferences we are authorized to draw from the present state of scientific discovery, and although I have ventured on broaching a new hypothesis of manures, I am well aware of the danger and insecurity of such generalization. We are far from being ripe for sufficiently explaining the changes and combinations which occur in the processes of growth; and chemistry is perpetually casting new lights which shew strongly the state of our former ignorance. Many of the vegetable products, for instance, are insoluble in water; of course cannot ascend in the sap, and therefore at the present moment it is doubtful how they are rendered subservient to the growing crop. They may, for anything we know, be dissolved in some acid or alkaline menstruums as preparatory to their admittance into the organization, or they may be decomposed into their ultimate elements.

When we survey the philosopy of our first agricultural writers, and see how grossly they were in error concerning the food of plants, and what strange assertions they advanced about the fertilizing influence of saline bodies, a melancholy gloom overshadows the mind, and we mourn the instability of human knowledge. The pace of future discovery may be as rapid as that of the past, and the next age may look back at the elucidations and theories of the present with the same feeling of intellectual humiliation.

Halifax, February 10, 1819.

TO CORRESPONDENTS.

As I am now to discontinue my letters till after the prorogation of the General Assembly, it may seem requisite that I should address my correspondents in general rather than those in particular who have written me during the last week. I must then express my warmest thanks for the unprecedented support I have received since I assumed the character of Agricola. At first, the communications sent me were few and meager of facts; but as I went on they swelled in number and in value. Without an uncommon measure of solicitude on the part of the public to furnish information, I could not have interwoven such practical details into these letters; and if they possess any merit of being applicable to the present state of the Province, the greater share justly belongs to the patrons of our agriculture, who have countenanced and befriended me. I am in possession of upwards of 250 letters, from all parts and all ranks of the Province. These contain much valuable matter; and although I have not been able to publish a tenth part, I have read them all attentively, pondered their diversified views and trains of thinking, and incorporated them, whenever the

subject admitted, into the fabric of my own composition. I call still on those friends to aid me with their contributions; and although these may not appear in the RECORDER (which many of them indeed strictly prohibit), I promise to extract from them whatever may be conducive to general instruction and to our future prosperity. To my later correspondents I have two apologies to make, which are especially befitting at this time.

The first is, that I have not been so regular in answering many private letters as was due to the respectability and kind wishes of the writers. This has arisen in a great measure from want of time, never in any instance of inclination. I have not been able to overtake the throng of business which poured upon me, and my weekly appearance has not occupied, but really engrossed all my attention. These letters, of which so much has been lately said, and on which a great deal of idle criticism has been wasted, are the work of more study than most readers would imagine. In addition to these, I had to prepare and correct the communications sent me, and which I selected for the press; to compose remarks illustrative of the views I was anxious to establish, and attend to other miscellaneous matters—all of which filled up my vacant hours, and often encroached on those which should have been employed in other purposes. My private correspondence was always deferred to the last, and oftentimes unavoidably neglected. The leisure I now contemplate will be partly devoted to pay up that long arrear of debt I owe to many worthy correspondents.

I have to apologize, in the second place, for not entering, contrary to repeated solicitation, into the present literary war, which is carrying on with such spirit, and with such signal success to both parties. My friends are very much divided in their opinion on this point—most of them approve of my neutrality, and strenuously advise me to steer clear of all disputes; others again treat this conduct as unmanly, and urge me to attack my adversaries. Hitherto my silence has been in obedience to the first class; my declaration is now in compliance with the second. This, however, is the only answer I shall give to the many writers who are busying themselves in inveighing against my composition, my motives and public conduct, and I shall never again even glance at them till I have finished the first part of the Synopsis. Were I to turn aside from my subject and exculpate myself from every little imputation, the scribblers of the day would give me enough of employment, and I could not move one step without perpetual annoyance. To avoid this I appeared at first under an anonymous character; and for the same reason I have entrusted my secret to none, save those who carry on my correspondence with the printer, and who, notwithstanding all the sagacious surmises afloat, have kept it inviolate.

I have nothing to say about the qualities of my style, which I leave to the mercy of the critics. If I am intelligible, I aim not at the higher ornaments, and must throw my faults on the public generosity.

The only justification I shall offer on the medals and other parts of my public conduct, which have been censured of late with so much

asperity is this, that I have acted under the direction of the proper officers appointed by the Provincial Society, with whom I carry on a secret correspondence; and to them only am I amenable.

I have this week received letters from the Reverend H. Graham, Colonel Crane, Mr. George Gillmore and several others, with the set of arithmetical tables—for all of which I return thanks.

LUNENBURG, February 3, 1819.

TO AGRICOLA:

Sir,—Agreeably to notice of the 28th December (so obligingly inserted by you in the RECORDER of the 16th January), a meeting took place, but, owing to the inclemency of the weather, was postponed until the 30th January, on which day the Magistrates, High Sheriff and a number of respectable landholders and farmers met in the Court House.

The committee appointed on the 28th December, consisting of the Rev. Roger Aitkin, Francis Rudolf, John Creighton and John Heckman, Esquires, having submitted to the meeting a set of rules for the regular governance of the Lunenburg Farmer Society, they were unanimously adopted; and the following gentlemen elected office-bearers:

President—Revd. Roger Aitkin.
Vice-President—Francis Rudolf, Esq.
Secretary—Henry Wollenhaupt, Esq.
Treasurer—Edward James, Esq.

COMMITTEE.

John Creighton, Esq. (J.P.)
John N. Oxner, Esq.
Henry Kaulback, Esq. (High Sheriff.)
John Heckman, Esq.
Mr. Jacob Boehner.
John C. Rudolf, Esq. (J. P.)
Philip Rudolf, Esq.
William Rudolf, Esq.
Mathew Ernst, Esq.
Mr. Gasper Ernst.
Mr. George Oxner.
Mr. Philip Arnberg.

It is intended to have the rules printed for the use of the members.

The society will use all the means in its power to give this county the benefit of your patriotic endeavours; but their labours will have to encounter great and peculiar difficulties. In the meantime, they have directed me to request that you will receive their thanks and best wishes, and trust you will live to enjoy the pleasing reflection of having

been the means of rendering Nova Scotia independent of any foreign power for a supply of grain or other agricultural produce.

I have the honour to remain, your most obedient servant,

HENRY WOLLENHAUPT,
Secretary Lunenburg Farmer Society.

MUSQUODOBOIT, February 2, 1819.

TO AGRICOLA:

Sir,—It is with pleasure I acknowledge the receipt of yours of the 16th January. To further your general views, a meeting of the inhabitants of this river was held on Monday, the 1st instant, when about twenty-four attended, several being necessarily hindered and some not having due notice. We, however, formed a society, to be called "The Musquodoboit Farmer Society", elected a President, Vice-President, Secretary and Treasurer, and a committee of six to frame bye-laws, etc. Our society will at least consist of fifty members, perhaps more, as a desire of improvement begins to prevail here. You highly merit our most grateful acknowledgments for your benevolent intentions and zealous exertions in awakening the spirit of agriculture throughout the Province from her death-like inactivity. The climate and soil of Nova Scotia are in no respect inferior to those of Britain, and were the same sort of tillage used, would be equally productive. But we hope the auspicious period is now arrived when the farmer, by adopting your improved plans of husbandry, united with his own industry, will assuredly banish want from our habitations, and our united exertions in the general cause will be crowned with opulance and success. It is lamentable to see year after year, even from the interior, our cash pouring into the pockets of the bitter enemies of Britain and all her colonial subjects.

When our bye-laws are framed, we shall then open a correspondence with the Central Board.

I am, sir, with great esteem, yours sincerely,

JAMES BENVIE.

REMARKS.

These two letters, the one from Lunenburg and the other from Musquodoboit, must convey pleasing and strong impressions to every reader. They show that the excited agricultural spirit is exerting itself in the full organization of the Province; and that all men anticipate benefits from the establishment of societies. I am truly glad that Lunenburg has given this declaration of the interest felt there in the general prosperity, and that county, from being long engaged in the pursuit of husbandry, is well calculated to give us practical lessons in this art which lies at the foundation of national independence, wealth and happiness. That industrious settlement is a model to all others;

by a careful cultivation of the soil, and by attending to the products of the garden, it has amassed more real opulence, and has a greater command of cash, than any other county, and is a public example of what can be achieved in Nova Scotia by the plough and the spade.

The establishment at Musquodoboit, founded by farmers for the purpose of improving agriculture in the District of Halifax, is a subject of grateful contemplation. The Provincial Society I have always regarded as the organ and grand spring of all the others distributed through the country, rather than as possessing any local attachments and interests. The capital is surrounded by a rocky waste, which precludes the operations of the farmer, and must always force it to depend on a distant supply. The members, therefore, of the society here cannot be viewed in any other light than as the GUARDIANS and PROMOTERS, not of their individual, but of the general improvement; and on that account, the Musquodoboit Association is in reality the link by which the district is to be connected with the great chain of our agricultural advancement.

These two letters also evince that the incapability of our climate and soil to ripen and perfect the bread corns and to produce abundance for our consumption is beginning to be regarded everywhere as an idle and vain theory. The powers of vegetation are here rapid and vigorous, and our summers sufficiently long for oats, barley, rye and wheat.

AGRICOLA.

YARMOUTH, February 20, 1819.

SIR:

The periodical letters which have lately appeared in the RECORDER under the signature of "Agricola" having excited a spirit of agricultural improvement in the Township of Yarmouth, a number of the inhabitants met on the 19th of January last and formed themselves into a society by the name of "The Yarmouth Agricultural Society." At same time they chose a President, Vice-President, Secretary, Treasurer and Committee, and adopted certain rules for its government.

They unanimously passed a vote of thanks to the Provincial Central Society in Halifax for their patriotic exertions, and to the noble President for his liberal patronage of the best interests of the Province.

SAMUEL S. POOLE, President.

AGRICOLA TO CORRESPONDENTS.

Since the Legislature has met for the despatch of public business, I have been addressed by my friends, both in and out of the House, on the great and momentous question which will be immediately agitated, and which will fix the fate of our husbandry. There are many points in these letters on which it would be highly indecent to offer an opinion, and with which I must decline all sort of interference. It would ill become an anonymous writer, even although he has been hitherto received with an uncommon degree of favour, to embark his character in the attainment of any measure which the constitutional guardians of the Provincial purse would not, of their own accord, carry into effect. I would abuse the public confidence were I to lend my name to any other purpose than the correction of those errors which exist in our agriculture, and the introduction of the best and most approved modes of culture. With respect, therefore, to the amount of the grant; to the restrictions and checks which the House may impose to secure its proper application; to the degree of influence which they may retain in their own hands over the public acts of the Provincial Society, and many other points of a similar nature, I shall preserve a profound silence, satisfied that they may be consigned with perfect safety to the wisdom and discretion of the Legislature. At all events, it is not my province to intermeddle with these delicate discussions; and I beg my correspondents to accept of this as at once my determination and excuse.

There is, however, one view of this subject to which my attention has been more strongly called, and on which there seems to prevail a wide and rather hostile contrariety to opinion. Some contend that the Provincial Society alone is entitled to pecuniary provision; that on it the liberality of government should be lavished, and that the whole grant should be voted in aid of its funds; while others violently oppose this measure and argue that they would neglect the interests of their constituents, and would be culpably wanting in their duty were they not to insist upon a subdivision of the legislative grant, and a specific appropriation of it to each and every county society.

I think the whole of this dispute has originated in misconception; and that, after the nature and constitution of the Provincial Society are unfolded and understood, the two parties will easily coalesce, as each may accomplish their object in perfect union and concord. The former think that the institution here, founded in the capital and possessing the means of importing seeds, live stock, implements and books, should have the management of the funds, and receive the exclusive countenance of the Legislature; while the latter are of opinion that if a sum is to voted by the representatives of the people, it ought to be shared among the county societies, that the agriculture of each may be alike beneficial. No step could be taken more destructive of our future prospects, and more injurious to the cause which is meant to be supported, than this subdivision of the grant, and there is no case con-

nected with our rural interests on which I hold a more positive and firm conviction. In this I am strengthened not only by reasoning and reflection, but by the example of that parent state which it is our honour as well as duty to imitate. In that country have been deeply studied the principles of political economy, the influence of public institutions, and the most successful modes of distributing rewards of excitement and emulation. But independently of copying from so bright a model, there want not arguments of commanding preponderance, by which to regulate our decision on the intrinsic merits of the question, and these I beg leave shortly to elucidate, as first in order and importance.

The Provincial Society I consider in no other light than as an organ of the Legislature. It is not an association of farmers, like the rest, collected for the purpose of improving in their art or of conducting a series of experiments, but it is an association of public-spirited and enlightened individuals, solicitous to promote a national object. It embraces whatever is respectable for wealth and talent in the metropolis, and is patronized by the high official characters, from the deep interest they feel in the general prosperity. So sensibly were these views felt at its establishment that the members waived the right of forming its constitution, or prescribing rules for its government, and devolved upon the Legislature the exercise of these primary functions of its own inherent power. And this was highly proper. The Central Society was even then contemplated to act under the direction and to be moved by the influence of the legislative power. It was to be the centre of union—the connecting tie—by which the multiplied views, pursuits and local attachments of the different county societies were to be linked together for a common end. It was, in fact, to be the spring of that complicated mechanism intended to be set in motion, to stimulate and exalt our internal improvement. Its elasticity and force must be derived from the means, and from the impulse given by the government. Such is the only rational and just light in which the Provincial Society can be placed. It has no distinct separate interests from those of the community; it is a body politic erected for a special and defined purpose; for this, its funds are to be kept sacred and inviolate; the different branches of the government are declared members EX OFFICIIS; they have a right to sway its counsels and guide its movements; and to sum up the whole, it is really no other than the organ of the legislative wisdom and power acting for the advancement of the Provincial legislature. It is to be the child of their creation, and it should be the object of their care.

I observe further that the pecuniary grant voted to the Provincial Society does not pass from the Legislature to another body that may expend it at pleasure, but, in truth, continues under the direction and control of the Legislature. For the sake of illustration let us assume that £1,000 are set apart for supporting the declared spirit of the country, and that this amount is voted to the society. In what manner, I ask, could this sum be disposed of consistently with the prin-

ciples of the constitution which the Legislature will decree in giving the society a corporate existence: Solely and exclusively to cherish husbandry and rural economy. The members of His Majesty's Council and of the House of Assembly come into the Provincial Society, point out the wants of the particular counties, propose the objects to be encouraged, the premiums to be given, the live stock, implements and seeds to be imported, and by the influence of their situations and talents they in reality preside over the appropriation of the whole funds. There can be here no balancing and opposition of interests between the private members of the society and the Legislature which can create a dread of any selfish or partial misapplication. None of those have so much as a farm to cultivate, unless we designate by that name the five-acre lots into which the peninsula is divided. They have come forward and subscribed themselves members of that institution, not to promote their immediate interests but the common interests of the Province. The benefits which they are to reap must flow from the prosperity of the farming classes; and they contribute their mite from no other motive than the impulse of a generous patriotism. True: if the Province succeeds in raising its own bread, the town will increase in wealth and in commerce, but this is distant and remote, and besides, can only take place from the right and proper direction, in the meantime, of the agricultural funds. There is not, therefore, the least ground of jealousy from the influence of the private members; and the legislative body is perfectly safe in associating with them, and in admitting them to a participation of rights. In addition, their annual subscriptions will at all times be double of what is requisite to be expended on the District of Halifax, and the surplus will be disposed of in furtherance of the common cause. Should it be asked by any objector if the branches of the government when assembled in the Provincial Society are to exercise this power over the distribution of the agricultural funds, why may they not as well exert this authority in their legislative capacity, and with the grant destine its appropriation? I answer, that the Provincial Society is the only proper medium through which this aid can be given to agriculture; and this can be clearly established by many cogent arguments.

It is essentially necessary to preserve a dependence of all the societies in the country on that in the capital, for the purpose of securing harmony among the parts, and enforcing a uniformity of plan and action. There will be manifold advantages resulting from this mutual connection, which ought on no account to be dissolved. The association here must be the focus from which the rays of light and instruction should diverge to the remotest extremities of the Province; and in it should centre the account of all successful and unsuccessful experiments, of all improvements, and, in short, of all agricultural information. To give it a becoming dignity in this elavated station, it must have power. It must be accounted the source through which all the gifts of the Legislature are to flow—as the rewards of merit or the excitements of enterprise. Dissolve by a suspicious or mistaken policy

this governing superintendence, and you rob it of all influence. It may continue the head, but it will neither have hands to act nor feet to walk. The county societies, enjoying their grant immediately from the government and possessing it of their own right, will disregard its injunctions, or follow them with a lukewarm and reluctant obedience. There will be neither unity nor arrangement in the direction of the national industry; but each society, acting independently and from narrow and contracted views, will in most cases forfeit the general to the county interests. Two thousand pounds so bestowed will be vastly less efficacies than half the amount placed at the disposal of the Provincial Society.

This is not all: the associations which have sprung up in all parts of the country have their origin in local and individual interests. The farmers have subjected themselves to rules, in order to receive instruction in their calling, and to cultivate the earth with more skill and success. These societies are composed generally of the best and worthiest members of the districts where they are founded, and in whom may safely be reposed the utmost confidence. But can it be imagined for a moment that these men have the same enlarged and comprehensive views—the same extent of political wisdom—and the same skilful direction of conduct, as must reside in the collective body of the Legislature, and the many enlightened official characters who constitute the Provincial Society? If there be talent in Nova Scotia, if dignity of thinking, if patriotic devotion of the heart, if political sagacity, they will be found in this institution. Besides the three branches of the Legislature, it embraces the bench of judges, the clergy, the practitioners of law and physic, the independent gentlemen and wealthy merchants of Halifax; and will not these men be much better able to direct the Provincial agriculture and guide it to happy results, provided the General Assembly refrain from breaking down the pecuniary grant into fractional sums, and bequeathing them like legacies to the other societies over which the Legislature can exercise no control, and which cannot be brought to an after-reckoning and account? It would be a prodigal waste of the public money, and would confound all the calculations of prudence.

Not a doubt rests on my mind about the propriety of the measure which I am now recommending. The Central Board, in order to occupy a commanding situation, must be regarded as the agricultural organ of the legislative branches; they must decree its constitution, as well as rule its proceedings, and they must religiously preserve the dependence of all the county societies on the expression of its will and pleasure. There will be otherwise neither harmony of design nor unity of execution; the farming body will become disjoined and irregular in the application both of industry and experiments; and our present hopes, which have cheered us with visions of future promise, will be blasted as by a malignant mildew. The institution in the capital should bear in the body politic an analogy to the heart in the animal economy. Nature here teaches us the very lesson we ought to copy;

and whenever the schemes of man can be molded into a resemblance of so infallible an origin, it is the extreme of folly to cast away the benefit of imitation. The heart is obviously constituted the centre of circulation and of energy. From thence the blood is propelled to all parts, with a view to warm, sustain and invigorate the system, and back it is again carried to repair the waste and receive new properties. It is thus that all the members and organs are made to depend on each other, and to unite in producing a consistent, perfect and harmonious whole.

But in this conclusion, seemingly founded on the clearest views of the understanding and on a train of irrefragable argument, we are abundantly borne out by the practices of the most refined nations of Europe. It would be vain to quote here the policy adopted by Prussia, by the Germanic States, or by France, all which agree in this leading point—of fostering and protecting one powerful society, by which to give life, motion and energy to all the rest: but I shall confine my illustrations to Great Britain, and show her plan of acting in the three kingdoms of which the empire is composed. In each of these there is a grand national institution under the immediate patronage of government, by which the agricultural interest is maintained and directed, namely, the Board of Agriculture in London; the Highland Society in Edinburgh, and the Agricultural Society of Dublin.

The last of these was first instituted, in point of time, to prevent the frequent recurrence of scarcity in Ireland, as the preamble sets forth, from the simple but invaluable science of agriculture being entirely neglected and misunderstood. It was incorporated under the denomination of the "Dublin Society" in 1749, and has contributed largely to the prosperity of that country. On its foundation, a royal donation of £500 a year was conferred by George II, which sum, added to the annual parliamentary grant of £5,000 afterwards given, and the subscription of its members, constitute a fund that enables it to exert the most beneficial influence over the whole island, and to keep alive the spirit of improvement in the other societies. So powerful and useful has this corporate body become that they at present maintain a professor of agriculture, another on chemistry, and a third on the veterinary art, besides a lecturer on natural and experimental philosophy, several masters, a librarian and a gardener.

The Highland Society of Scotland was next in the order of establishment, which took place in 1784, but it was not incorporated by charter till 1787. The first donation was £3,000 out of the money paid on the restoration of the forfeited estates; and in 1789 its revenue was further augmented, from the liberality of government, by a grant of £800 a year. Its members pay a guinea annually towards the funds, and 2s. 6d. for incidental expenses, and the number of these has increased so rapidly, being now upwards of 1,130, that the society can extend its protection to every branch of improvement, and embrace many objects not within its original contemplation.

The Board of Agriculture took its rise in the patriotic efforts of one man—Sir John Sinclair—who has devoted his life to the good of mankind and the encouragement of husbandry. It was constituted by royal charter in 1793, and its range of action was to extend over the whole of Great Britain. At its first institution, although in some measure obtained by the sufferance and passive acquiescence of the minister, a sum of £3,000 annually was voted by Parliament for its support, besides several valuable privileges and powers conferred by the charter. It is unnecessary to pursue the history of these institutions at greater length, or to point out the various sources of revenue which augment and consolidate their utility, as the mighty dominion which they now exercise over the national industry and improvements is a demonstrative proof not only of the wisdom which contrived their beginnings, but of the ample funds with which they are invested. These three great establishments extend their protection and encouragement to the different districts, shires or parishes of the United Kingdom; direct the tide of enterprise; publish from time to time their prize essays and transactions; hold out premiums; correspond with the government on important national subjects, and are the main springs of that excellent system of husbandry which has increased the happiness and confirmed the stability of the country.

To none of the county associations formed of practical farmers has there ever been any parliamentary aid administered, and indeed there has been no application for such aid, because the government has sufficiently discharged its parental duty, in founding and endowing those institutions which were to protect and invigorate the whole. Upwards of £15,000 sterling are annually expended by these corporate bodies; and the greater part is the immediate gift of Parliament. The advantages derived from this liberal patronage have been recognized by all political parties; and no inconvenience has been felt, during the experience of more than half a century, in withholding legislative support from all the lesser associations, which naturally take shelter under the wing of the great and protecting parents.

AGRICOLA.

Halifax, February 23, 1819.

To AGRICOLA:

Sir,—On the 15th of February last, a meeting of a number of the principal freeholders was held here, when a society was formed, called the "Noel Agricultural Society," and the following officers were chosen, viz:—

Mr. Archibald Kerr, President.
Mr. John J. Archibald, Vice President.
Mr. Jacob O'Brien, Treasurer.
Mr. Timothy O'Brien, Corresponding Secretary.
William O'Brien, Esq., Recording Secretary.

John Faulkner,
J. J. Archibald,
Timothy O'Brien, } Committee.
William Wallace,
Robert O'Brien,

This society, as well as the part of the country where it is established, is yet in its infancy; but the land in general is good and capable of great improvement.

We belong to the County of Hants, and are remote from the quarter in which the Hants Agricultural Society exists, so that we can look for little advantage from it, more than from any other in the Province. We hope, however, that from our own some benefit will arise; and we have need to attempt everything in our power for the advancement of agriculture amongst us. I need not add that it is to your generous exertions alone in stirring up a spirit of enterprise among agriculturists that we are indebted for what begins to appear amongst us.

Hoping that the zeal which you have excited may not prove less beneficial than it has hitherto been ardent, and that it may continue to promote the agricultural advancement of the Province,

I am your obedient servant, in behalf of the society,

TIMOTHY O'BRIEN,
Corresponding Secretary.

Noel, 2nd March, 1819.

To Agricola:

Sir,—I was bred in this country, and am well pleased to see its improvement. I must confess that I had very little hopes of much good coming out of your letters at first, and although I read them, like my neighbours, I rather wondered than was instructed; but I am now beginning to think that we shall be benefitted in good earnest. In our settlement, we have always (some good years excepted) had much difficulty in raising our own bread; and when our wheat crops failed, the purchasing of flour was a great evil and a heavy drain on us. Within these two years I had to reduce my stock of cattle to buy bread for my family, which not only has hurt me, but all our neighbourhood. The mice did us serious injury; and I am very mistrustful of them this season. The snow has so long covered the ground that I fear they will come out like locusts on us in the Spring and Summer, and destroy the fruits of the earth. I wish you, or some of your correspondents, would turn your attention to these vermin and contrive some effectual means of guarding the country from their ravages, which in my opinion resemble so much the plagues of Egypt that I sometimes think they are sent to us for our sins.

But this, sir, is not what I intended particularly to write you

about, although it too is a very important matter for our speedy improvement, for you may write as much, and as long as you please, it will be all to no purpose if these vermin pay us their usual visits, and eat up the grass and corn by the roots. I would like to hear what you have to say upon them, with any remedies you may think of. But the principal thing I wish to mention is the introduction of oatmeal in this part of the Province, and the likely advantage we are to receive from it. I had a great prejudice against it at first, and must acknowledge it was not very palatable. I tasted it first in Truro as bread, and although I did not like it, it was far from being disagreeable. I thought of it then rather as a curiosity than to be of any good to the country. When I went back to Truro, three weeks afterwards, I sought after a piece of these Scotch cakes, and on making a second trial, I disliked them much less than at first, and it then struck me that I should have myself a few bushels of my oats converted into such meal. I carried this resolution into effect before another eight days, and had it home to my family. From the novelty of the thing, the children began to eat it in bread, but after the second trial, neither entreaties nor threats could induce them to touch it. Through persuasion, however, my wife always used it when at table; I myself became fond of it, and thought it more nourishing than our flour bread. We were in this state for nearly a month, when one day a neighbour called at the house, and the conversation turning on oatmeal, he preferred it, he said, made in porridge, and taken with milk. We tried it that evening in this new way for the children; they seemed to relish it, and ever since have continued fond of it. By degrees they began again to taste the cakes; and at this time oatmeal is now our staff of life, and is coming very fast into use throughout the whole District of Colchester. Although your writings had done no further good to this country than bringing us to an acquaintance with this very useful and economical method of employing our oats, your time would have been well spent, for any farmer may make himself independent in point of bread with half the trouble, and less than half the risk, by turning his attention to the culture of oats. Plump, well-filled grain of this kind is, I think, as two to one when compared with wheat; and as the latter is worth on an average ten shillings, good oats are now worth five in real value; and besides, they are a sure crop, not subject to so many accidents, raised on almost any kind of land, and well-fitted to the soil and climate of this Province. But, sir, as oats formerly only brought from 3s. to 3s. 6d. per bushel, the additional value given them, by converting them into wholesome meal, is to be ascribed to your labours; and could we succeed in getting the proper mills erected (which I hope to see general in a very few years) we would get on very fast in improvement. I never believed till now that this Province could raise its own bread; but I am convinced that nothing is more easy, and I, for one, shall this year now double the quantity of oats which were ever before raised on my farm. The potato oats are preferable for mealing, and I would recommend to all

such as mean to cultivate this grain, to obtain, if they can, such seed. Four bushels of these will produce 1 cwt. of meal; whereas five or five and a half are necessary of our common oats.

Wishing you all success, I am, your very humble servant,

J. ARCHIBALD.

Colchester, March 18.

REMARKS.

The advantages to be derived from the establishment of agricultural societies seem now to be fully appreciated; and during the course of the season I trust that every settlement in the Province, of moderate extent and importance, will combine its more respectable freeholders into such associations. Not to mention the facilities which will be thus given to the superintendence and operation of the Provincial Board, the unity of plan no less than the quickness of communication, these men will improve and perfect each other in their ordinary calling, and the accidental discoveries of any one member will become the joint stock of the whole body. It was with no small degree of satisfaction that I opened the first of these letters announcing the formation of the Noel Society; and my pleasure was enhanced by the circumstance that the event was quite unexpected, having been apprized of it by no previous correspondence. The measure has been the spontaneous suggestion of their own minds, free from any foreign impulse, and on this account it is the more deserving of praise.

The second letter treats on a very important branch of our internal improvement, and which in the present state of the Province is entitled to a large share of attention. Convinced as I am of the impracticibility of raising enough of wheat for our consumption till our husbandry is considerably advanced in machinery, skill and capital, oats seem to present the boon of early independence, and to anticipate and realize our hopes much sooner than the natural course of things. Certain prejudies, I know, exist against the general introduction of this grain, and the tastes of people in their daily food, formed by long habit, are altered with much difficulty. Man, however, with all his prepossessions and modes of living, is the child of situation, and has in himself an accommodating power to the circumstances with which he is surrounded. The Russian comes to relish his train oil; the Swede and Laplander, their brown bread mixed up with bark, and the Scotch nation, from time immemorial, have shown a predilection for oatmeal. As this Province has taken its name from Scotland, and it has been mostly peopled by that hardy, patient and enterprising race, why should they not here be partial to the manners of their forefathers, and practically style this, their new habitation—THE LAND OF CAKES? The Athenians, in founding their colonies along the shores of the Hellespont and Bosphorus, as well as in Asia Minor, imposed on the adventurers as a sacred duty to the State, that they should transport to

the new settlements the laws, the institutions, the maxims of war and peace, the manners, the dress, the living, as well as the gods of their country. As they had been educated Greeks, such too they should live and die. Patriotism was their ruling passion; and although they transferred their interests and attachments to a foreign soil, they were bound by every tie, human and divine, not to forget the place which gave them birth. National feelings ought to determine Scotchmen to the culture of this grain, and to the introduction of oatmeal into their families as a staple and essential article of food. Englishmen, too, particularly from the northern counties, were accustomed at home to this sort of meal; and its use is almost universal in Ireland. I see then no obstacle to a very general consumption of oats, and to a consequent national saving which would have a mighty influence on the accumulation of wealth. It needs only a beginning, and if some of our distinguished characters, in the upper walks of life, and who are of Scottish origin, were to set the example of producing oaten cakes at table, the practice would spread with the rapidity of lightning, and all classes in this community, from a regard to our agricultural prosperity and independence, and the mere force of fashion, would be powerfully induced to try them. Ask the natives of Nova Scotia who for the first time this winter have begun to eat the bread I am recommending, whether or no it is palatable and wholesome, and they will give their testimony in its favour, and moreover assert that our climate is admirably adapted for producing it with certainty and in abundance. On what ground of policy are we then justified in thus neglecting the capabilities of our soil, and in overlooking a grain so full of present benefit and future promise? I call on the agricultural societies, wherever founded and whatever nation—I call on the patriotic and independent freeholder—I call on the whole agricultural body—to direct their efforts to this species of cultivation; and to hold out encouragement, according to their respective means, for the erection of suitable mills. Oatmeal, for many purposes, will supply the place of flour, is equally healthful to the body, no less pleasing to the taste, and more compatible with the present state of our husbandry.

AGRICOLA.

Halifax, April 1st, 1820.

Rose Bank Cottage, Sherbrooke,
March 26th, 1819.

To Agricola:

Sir,—From your laudable exertions to promote agriculture in this Province, I take the liberty of enclosing you the proceedings of a society formed in the New Military Settlement of Sherbrooke. The settlement is still in its infancy, and composed of men who are very little versed in farming, and quite unacquainted with the nature or even the names of roots, and also with what grasses and seed they

should use—having passed the most of their days in the service of their country. Any advice you may be pleased to give on this subject will be gratefully received.

I am, sir, your obedient servant,

W. ROSS.

P. S.—I have the pleasure to inform you that we have two hundred and one bushels of winter grain at present in the ground.

PROCEEDINGS OF THE SHERBROOKE AGRICULTURAL SOCIETY AND COMMITTEE.

At a meeting of the inhabitants of Sherbrooke Military Settlement, called for the purpose of taking into consideration the necessity of forming an agricultural society.

It was unanimously resolved—

First—That William Ross, Esquire, should be President.
J. S. Wells, Esquire, Vice President.
Mr. John Hunt, Treasurer and Secretary.

Secondly—That a committee should be formed to act in concert with the above officers, for the good of the society, and the following were nominated for that purpose:—

D. W. Crandall, Esq., J. P.,
Mr. Joseph Gates,
Mr. Samuel Steel,
Mr. James Brown,
Mr. William Larder,
James Walker, Esq., J. P.
Mr. Robert Patterson,
Mr. George Perrier,
Mr. William Griffin,
Mr. William Light.

Thirdly—That after entering the subscribers' names, the committee should meet again at Mr. Gates' house, on the 27th February, for the purpose of determining on the most necessary seeds to be imported in the approaching Spring.

Resolutions of the Committee.

At a meeting of the committee, held on the 27th February, 1819, agreeably to their determination in the last meeting, for the purpose of considering and deciding on seeds, etc., needful for the infant settlement, it was

Resolved, That on consideration of the little knowledge of agriculture possessed by the members of this society, it will be expedient to depend entirely upon the advice of the Provincial Society for such seeds as they may deem most fit for so young a settlement.

Resolved, That a reward of five pounds shall be paid out of the funds of the society to any person or persons who may find a bed of limestone in the settlement—and that the society should receive *gratis* whatever quantity they may want for their own use, for 12 months, from the proprietor.

Resolved, That a communication of our proceedings shall be made to the Provincial Society, and also to Agricola.

Resolved, That D. W. Crandall, Esq., J. P., and James Walker, Esq., J. P., of Chester, should form a part of the committee and act for the society in their neighbourhood, when occasion required.

J. HUNT, Secretary.

REMARKS.

I have the satisfaction of announcing the formation of another society, at Sherbrooke Settlement, no less unexpected than the last, at Noel. When a general sentiment pervades a whole people, it breaks out usually in the capital and the more populous counties, and by degrees is propagated to the remotest extremities. Such has been the history and progress of the present Agricultural spirit. These associations were first formed throughout all the counties and districts; and latterly we have had the Musquodoboit, Noel and Sherbrooke Societies. Some have expressed a fear that these establishments, however useful in spreading knowledge and emulation, may be multiplied too much, and that their increase should be discouraged in all those places which are within a moderate distance of the County Societies. There is no danger to be apprehended from this cause so long as there is not more than one in every settlement consisting of from fifty to a hundred families; and the farmers in these situations will derive much benefit from stated quarterly meetings, where their common interests are discussed, and where they can learn from each other whatever discoveries or improvements may have been lately introduced. There are yet many places throughout the Province where such societies may be erected with advantage, and I do expect to see them in a short time more widely extended. Manchester, St. Mary's, Stewiacke, Rawdon, Economy and Parrsboro are, among others, convenient and highly eligible stations, and I solicit the men of influence to adopt the necessary steps by which to bestow on their neighbourhood the incalculable benefits of Agricultural instruction and of connecting with the Provincial Board.

I am happy to observe that my efforts to fix the attention of farmers on lime as a beneficial manure have not been thrown away, and that everywhere there is a general search after it, and a just appreciation of its value. It is easily detected by means of the muriatic acid; and I would urge every society to procure a quantity of this from the druggists here, and which should be kept by the secretary, as by far the most certain and infallible test of limestone. A pint-bottle can be

filled with it for 2s. 6d. and it will hold enough for making thirty or forty experiments. By pouring the liquid on the stone, or dropping a small bit of the stone into as much of the liquid as a wine-glass will contain, lime will be detected by a rapid and violent effervescence, or (to speak without the language of chemistry) by the escape of air-bubbles emitting a very pungent smell.

AGRICOLA.

Halifax, April 9th, 1819.

Halifax, April 14th, 1819.

About this period I was solicited on all hands to disclose myself, and appear before the public in my real character. It was argued by my friends that the ends of concealment were now accomplished, that an ardent spirit of improvement had been breathed into the Agricultural body, that a zealous manager was now needed to guide the machine which had been set in motion, that the Central Board had been incorporated conformably to my suggestions, that the Legislature had voted £1500 for Agricultural purposes, that the present Secretary, the Honourable Brenton Halliburton, was anxious to resign the office he had only accepted in trust, and that the Directors would feel greater confidence in their measures if I would come forward, take part of the responsibility and bear a share of the burden. Induced by these reasons and the wishes of His Excellency—the Earl of Dalhousie—I yielded, and threw aside the mask of Agricola. But this step cost me much thought, and was a departure from my original design. These letters of mine were never regarded in any other light than as the occupation of my leisure hours, and as the means of correcting the gross opinions which everywhere prevailed respecting the capabilities and resources of this fine Province. I saw and heard a climate universally spoken against which was infinitely superior to that of my native country, and which could ripen productions that scarcely lived under glass in Scotland. The system of husbandry was wretched in the extreme, and the profession of a farmer little short of being despised. A visible poverty since the treaty of Paris was benumbing every faculty of intellect, begetting habits of languor and inaction among the people, and preparing them to descend into the lowest abyss of humiliation. The American flag waved triumphant in the port of Halifax, and was dispensing to us, by way of indulgence on the part of the government, those very products which our own soil could abundantly furnish, had its productiveness been excited and drawn upon by a vigorous industry. The proud and independent spirit of a Briton burned fiercely within me, and I vowed the surrender of my vacant time to the good of the country I have adopted. After some little deliberation I laid my plan, not to write a system of Agriculture, but to combat as well existing errors, as to light the glow of patriotism; and the synopsis, no less than its execution and development so far as they have yet proceeded, bear

evident marks of this predominant feeling. But a regular attack on the prejudices and habits of the people exposed a writer to much resentment. For that reason I resolved on acting behind the curtain, and shutting myself from the gaze of the public. I did not put even my printer in possession of the secret, and no small difficulty lay in contriving a mode of communication with him by which I should avoid detection. That I effected by the intervention of a third party—Dr. William Petrie—who passed betwixt us under all the sanctions of the most inviolable secrecy. My first purpose of remaining forever concealed was in no instance shaken till His Lordship the Governor, in the meeting, December 15th, 1818, called to organize the Central Society, named me as Secretary. It was the only circumstance in that day's occurrence which disconcerted me for a moment, for I heard all the enconiums passed in the course of the discussion with the most immovable indifference. But any tolerable judge of human nature might have discovered the unknown Agricola in the involuntary heat and flush of his countenance at this appointment. But the effect was as transitory as sudden, and it almost instantly subsided into unruffled composure. This event gave rise to a new train of ideas, and I began to hesitate whether this mystery in the writer might not prove treachery to the cause. I meditated deeply and frequently the policy of laying aside my personated character, and often resolved and re-resolved without coming to a satisfactory conclusion.

During this state of doubt on my part, the public curiosity was on the stretch, and a thousand schemes were resorted to, to find out the secret. Notwithstanding all my care, little circumstances transpired which pointed to me some share of the suspicion, and my more intimate and immediate friends, who had access to my private hours, failed not to remark a seclusion which they thought must be devoted to the composing of these weekly letters. Still the matter was in a state of dubiety, and nothing positive or very certain had been discovered to set it at rest. But the busy and the inquisitive had assured themselves about this time, by means of several ingenious contrivances, that all others on whom suspicion had fallen were not concerned in the writings. A clergyman, who by many was long regarded as the author, and who was accounted fully equal to the undertaking from his close attention to rural affairs, went out of town for a few days. A letter was insidiously dispatched to me requiring an immediate reply. Without knowing the stratagem, I answered it the same afternoon on which it was received, and thus gave infallible proof that the gentleman in question was not the object of their search. By such means conjecture was drawn within narrower limits, and at this date there was a pretty general expectation that I would turn out to be the writer who had so long worked the secret springs of the Agricultural movements.

When a whole people feel interested in making a discovery, it is almost impossible to elude them. By comparing notes with each other and collecting their scattered hints, they are in a condition to deduce

inferences of great probability, or at all events to avoid any serious mistakes in their reasoning. Almost all the leading men of the Province either possessed my handwriting themselves, or had seen it in the various private communications which I am sending by every post to my numerous correspondents; and although the characters were intentionally reversed and lay reclining from left to right, still there was a resemblance in their form and shape by which they were guessed to have come from my pen. My ordinary handwriting was compared with this counterfeit one, and the truth, I fear, too often shone from beneath the disguise.

All these considerations had their weight in determining me to step forward in my own person, and assume the duties of the office which had been assigned me. A few days, therefore, before the meeting of the Provincial Society, which was now called by the Governor—the Earl of Dalhousie—in conformity to the act of incorporation that had just received the sanction of the government, I wrote His Lordship and subscribed my real name. An interview immediately followed, and thus the long-contested secret was finally divulged.

As this volume professes, as a main object, to contain the history of our progress, and to narrate the steps by which from small and inauspicious beginnings the Provincial Agriculture suddenly rose to importance, it has been judged expedient to interweave the letters with all those events that are in any degree illustrative of this happy change, or which tended to its accomplishment. For this reason I have given the details, published at the time, of what occurred in this first meeting at which the Central Board entered on the exercise of its functions, and took the management devolved on it by an act of the Legislature.

JOHN YOUNG.

AGRICULTURAL SOCIETY.

The stated General Meeting of the Provincial Agricultural Society took place yesterday in the House of Assembly at 11 o'clock, and was numerously and respectably attended. On this occasion His Excellency the Lieutenant-Governor took the chair and opened the proceedings shortly but comprehensively by stating:

Gentlemen,—According to the law passed for the incorporation of this Society, I was obliged to call you together on a shorter notice than I could have wished; but it is provided in the Bill of Incorporation that this meeting should take place while the House of Assembly is in session, and in compliance with that order I convened you this day. I am happy to inform you that the Legislature has been liberal in its grant to this institution, and that the sum of £1500, in aid of the funds, is placed at its disposal. By means of these, it is intended so to direct the National Agriculture, and fulfill the purpose of this Society, as to lead to happy results, and the gentlemen who understand

the details of this business will lay before you the application of the money.

Mr. ARCHIBALD then rose and said:

MY LORD,—This Society was formed under the immediate patronage of Your Lordship, and I am happy to observe that the Legislature has seconded in so desirable a manner the laudable views of Your Excellency. The grant, along with the private funds, will enable the Society to carry into effect the objects it contemplated. It was a pleasing sight to witness this day, for the first time, a meeting of the Central Board, and also to see in his place the gentleman who, under the signature of AGRICOLA, had rendered by his writings so much service to the country. With Your Lordship's approbation I shall sketch to the Society the general appropriation of the funds for the current year, which I hope will be generally acceptable.

On purpose to direct the Agriculture of the country in a useful channel, it is proposed to give £500 in prizes to the societies now in operation; and to reserve £100 to be applied to the same purpose for such other associations as might be formed under the protection of the Board. A further sum of £540 was meant to be allotted for the importation of live stock, seeds and machinery; and the further sum of £160 was to be divided into eight bounties of £20 each to aid the erection of oatmeal mills throughout the Province.

It was further intended to have two cattle shows—one at Horton Corner, for the convenience of the neighbouring counties, and another at Truro, to suit Pictou, Cumberland and Colchester. These different sums exhausted the Provincial grant except £100, which was set off for incidental charges. He would not at present descend farther into particulars, as Mr. Young would explain at greater length the objects to be accomplished.

Mr. YOUNG, Secretary of the Society, next rose and went more into detail regarding the specific appropriation of these sums. He began by remarking that the great object of this establishment was to excite a spirit of industry and enterprise, as well as to direct the particular modes of culture; that it had been found a powerful stimulus to exertions in other countries, to hold out Agricultural premiums; that, in conformity with that acknowledged principle, the sum of £500 was set aside to provide these prizes, which were to be distributed among all the local societies now formed; and that the Board had in view six great objects—which were suitable to the infant state of our husbandry.

I. To introduce summer-fallow as a preparation for wheat. The old cultivated lands were, many of them, overgrown with weeds, and this system would tend effectually to extirpate these, to say nothing of the other benefits resulting from the plan.

II. To extend the culture of oats. It was well known that this grain under our general management degenerated in quality, and that the seed, though it might weigh from 40 to 45 lbs. per bushel on importation, sunk as low as 28 to 30 lbs. after the first or second sowing.

By turning the attention of farmers to this grain, it was intended to keep up the weight, character and quality of the oats, for which our soil and climate were peculiarly fitted. Besides, it was acknowledged on all hands, that the present state of our husbandry was insufficient to provide enough of subsistence in wheat for our population; but oats came in as a useful substitute, and by extending them in all the settlements, this Province would soóner reach independence with respect to bread-corn.

III. It was meant to encourage the use of lime. He felt happy in stating that already some efforts were made in this walk of industry and that considerable quantities of rock were prepared for burning during the last Winter. He conceived that this new manure would advance our Agriculture more rapidly than could be easily imagined; and that it was the object of the Society to confer premiums on those enterprising individuals who took the lead in this improvement.

IV. Drill green crops were also within the contemplation of the Board. The encouragement of these was a highly proper object, because they necessarily introduced more perfect machinery, besides preparing the land for after cropping. Turnips this year would be cultivated to a greater extent than at any former period, and although there might be apprehensions entertained about preserving them during the Winter effectually from the frost, yet when the minds of men were strongly turned to this subject, he had no doubt but a plan would be fallen upon, suitable to our climate, to accomplish this end. Mangel wurtzel was a new root which would be cultivated for the first time in Nova Scotia, and seeds were provided by the Central Board for distribution.

V. The next object to be promoted by prizes was the clearing of the forest. The Society could not lose sight of so important a measure, which ultimately added to the arable land of the Province, and in the meantime, although encumbered with roots and stumps, increased the pasturage to the farmer.

Lastly. To beget a spirit of emulation among our young men, it was proposed to hold out certain premiums for ploughing matches. It was impossible to introduce the drill machinery till we had trained expert ploughmen, who could lay down the furrow slice in straight lines; and such competitions would have a wonderful effect in stirring up the most generous and powerful passions in our nature to the perfection of this art. It lay at the basis of all good husbandry.

Such were the general objects meant to be encouraged, and the sum of £500 was to be divided, according to a scale afterwards to be agreed upon, among all the societies in the Province.

As an inducement to the establishment of others in different parts where they might be useful, £100 were kept in reserve, to be parcelled out among such new associations as might immediately constitute themselves, and come under the protection of the Board. This sum was to be distributed among them in premiums, and on the same scale as might be adopted for the existing societies.

Another grand object with the Provincial Board was to improve the live stock, the machinery and the grain by new importations. For these ends the sum of £540 was set apart. It would be unnecessary to detail all the specific seeds which might meet the approbation of the Board, but, among others, potato oats from England bore a conspicuous place, as well as Poland and Swedish wheats, and rye grass seeds to be mixed with our clovers. These we might import either from Britain, the States or the Canadas; and the directors would afterwards determine according to the best information they could collect.

But it was in their immediate view to import Canadian stallions which unite strength with action in order to improve our stock of Agricultural horses, and also stallions of that middle breed, which are known in England to be a mixture of the strong draught horse with the active and spirited hunter. Dairy cows too from Ayrshire, which have attained a peculiar character of distinction from the long and persevering efforts to improve them, might be advantageously brought here, and would yield a much greater quantity of milk than we have been accustomed to receive from our present race. Swine might be added to the list of importations, and perhaps if the appropriated sum did not fall short, some rams of a choice breed.

The Secretary went on to observe that it would be in vain to encourage the culture of oats with a view to be converted into meal, unless mills of that description were built in the different settlements; and on purpose to forward this grand object it was intended to destine the sum of £160 to be divided into eight bounties of £20 each, and to be given to such persons as engaged in these erections. The site of the mill, for which a premium is to be assigned, must be approved of by the county society, or by the minor local society in the immediate neighbourhood; and the application for the money must be forwarded to the Provincial Board, to receive their confirmation and assent.

It was not necessary for him to say anything regarding the cattle shows, which are so particularly described by Mr. Archibald, as the advantages attending them were manifest. On the whole, he concluded with expressing a hope that these appropriations would be generally acceptable; but the society was prepared to hear any alterations which might be suggested.

His Excellency then asked if any gentlemen—members of the society—wished to propose any improvement of the distribution of the money which had just been stated.

The Attorney General remarked that some inconvenience would arise from the distribution of the money among the minor societies, and that it would be better to place them under the direction of the county associations, as it would create much trouble to the Provincial Society to hold correspondence with them.

The Secretary here explained and stated that it might be prudent to take that trouble in the meantime, in order to encourage and instruct them.

His Excellency next observed that as there appeared no objections

to the scale of appropriation as detailed by Mr. Young, he took it for granted that it was approved. To prevent all misunderstanding, he wished that it might be again gone over, and the committee in the management of the business would adhere to it, as far as circumstances would allow.

SCALE OF APPROPRIATION.

For encouraging the 14 societies	£500
For encouraging any newly-formed societies	100
For importing live stock, seeds and machinery	540
For erecting the first eight oatmills	160
For two great cattle shows	100
For contingent expenses	100
	£1500

Mr. LAWSON, the Treasurer of the Society, said that of the private donations and subscriptions about £530 were collected, and that there was little doubt but the remainder would be paid upon application to the subscribers. The whole amounted to £706 6s. 8d., and the annual subscriptions might be about £300, which for last year were included in the above sum.

The Honourable Judge HALLIBURTON begged leave to suggest that this was the proper time to call upon the public spirit and patriotism of the people in support of the establishment, as he learned that several respectable inhabitants were inclined to subscribe and become members of the society.

His Excellency again rose and expressed the great pleasure he had personally felt in introducing to the society Mr. John Young, who by his writings had excited the zeal that led to its establishment. The office of Secretary, His Excellency had the satisfaction to state, had been accepted by Agricola, who had so ably shown himself capable of conducting the business in a way honourable to himself and, he doubted not, beneficial to the Province.

Mr. YOUNG rose in reply:

My Lord,—The honour you have this day done me calls for the warmest expressions of my gratitude, and I would express them were not my mind filled with one great and overpowering sensation. I cannot arrogate to myself the merit of our past Agricultural efforts. I was supported by Your Lordship's countenance and by a generous public, who contributed largely in furnishing the materials from which these letters of mine were compiled. I can hardly look around me in this respectable assembly without recognizing the faces of those numerous friends who lent their assistance to my writings. These, in fact, owe little to me but industry and perseverance. When I share therefore with Your Excellency, who early encouraged me in the undertaking, and with my many correspondents, the honours of Agricola I can only lay claim to a small portion. I was little more than the organ of

the general sense of the Province, and I trust that I shall still be upheld by the same general encouragement. Allow me therefore to offer to Your Excellency and to this respectable assembly my sincere and heartfelt acknowledgments.

The meeting then adjourned.

HALIFAX, April 24th, 1819.

PROVINCIAL AGRICULTURAL SOCIETY.

The committee of management, consisting of

The Honorable Judge Halliburton,
The Honorable T. N. Jeffery,
S. B. Robie,
S. G. W. Archibald,
H. H. Cogswell,
} Esquires,

met this day in the Province Building, by the orders and under the direction of His Excellency the Earl of Dalhousie, for the purpose of making preliminary arrangements, with a view publicly to announce the distribution of the £500 set apart to provide prizes for the encouragement of husbandry. There were two principles which regulated the division,—the extent and importance of the counties—and the number of societies already established in each. To Annapolis and Cumberland severally, the sum of £50 was assigned; because these two sections of the province contain the greatest comparative surface, and have only given rise to one association; and for a like reason, £45 were appropriated to the agricultural society in Sydney. Pictou, Colchester, Halifax, Hants and Lunenburg were regarded by the committee as preferring equal claims to attention; and, of consequence, the sum of £40 was destined to their respective societies; and further, because King's County comprehends a vast extent of rich dike land, and from its early occupation by the first settlers, is considerably forward in the arts of agriculture, the larger sum of £60 was allotted to its two institutions, and divided equally between them. The other four were considered as minor societies, and hence entitled to a small proportion of the general fund. To the Noel and Sherbrooke societies £20 individually were assigned; £5 more were added to Musquodoboit, because the association there embraces members, living partly in the district of Halifax and partly in that of Colchester; and the amount of £30 was given to the Yarmouth, confessedly a minor association, because it was the only one in the county of Shelburne. Upon these views the present scheme of division was drawn up, and finally settled.

For Sydney	£45
" Cumberland	50
" Pictou	40
" Colchester	40

For Halifax	£40
" Hants	40
" Lunenburg	40
" King's County	30
" Union Society of King's County	30
" Annapolis	50
" Noel	20
" Sherbrooke Military Settlement	20
" Musquodoboit	25
" Yarmouth	30
	£500

These respective sums shall be bestowed on the fourteen societies, now constituted and in operation ; provided compliance be given to the instructions of the Central Board, and becoming efforts made by members to gain the different prizes, conformably to the subjoined regulations. The objects of improvement which are in view, involve the vital interests of the province ; and, it is hoped, that the farming classes will strive in the illustrious race of competition, and generously bear in mind, that while they are earning these peaceful rewards of the plough, and exalting their own names in the annals of our infant agriculture, they are laying the deep and lasting basis of future national grandeur and prosperity. All the gay prospects, which the present hour illuminates, and which are gilded with the hopes of futurity, will be suddenly overcast ; unless the glow, which is felt, animates to enterprise and action. We must shake off the slumbers of supineness ; we must divest ourselves of the benumbing prejudices of education and early youth ; and fearlessly venture on a a new and untrodden path. We must believe and without hesitation, that the soil on which we tread, is sufficiently bountiful to recompense our labours and to provide amply for all our wants. The powers of vegetation must be courted with a skilful and persevering assiduity ; and the failure of the first rude essays, instead of plunging us into unmanly depression, must only call forth fresh vigour and provoke to redoubled application. We must commence our operations with the fervour of enthusiasm, and pursue them with the unconquerable obstinacy of a settled and unshaken purpose. Difficulties we have in abundance to encounter ; errors we will most certainly commit ; opposition will follow our every step, and bark in the train of improvement ; but the elevated mind, firm of resolve and unmoved by surrounding circumstances, must fix its eye on ultimate success, and labour to attain it, in despite of the thousand obstacles which cross and retard its progress. Such must be the determination of the agricultural body in entering on the approaching farm-work. Every society must be zealous in infusing the proper spirit into its members, and in taking care that the grand objects of the Central Board be neither defeated by indolence, nor villified by the false colourings of misrepresentation. It will be a blot on the public

spirit, as well as a melancholy index of the low state of agriculture in the different counties, unless every prize be actually contended for and won. The names of all the successful candidates will naturally and in due form be enrolled in one honourable catalogue, and transmitted to future ages; unless our children shall want that generous feeling, that will lead them to look back on our present efforts with respectful gratitude. The perishable materials of humble and private life may be thus snatched from the wreck of time; and some obscure individual, buried in the wilds of our forests and unknown to fame, may escape that oblivion which otherwise awaits him.

It was the unanimous opinion of the committee, that the sums allotted to each society could not be more judiciously nor usefully applied, than in importing or manufacturing here the drill machinery in all its branches; and they, therefore, determined to offer a complete set as part of the prizes to be conferred on successful merit, in all those societies whose share of the general sum amounts to £40 and upwards; and where the proportion was less, to bestow in the meantime only, the more needful instruments of that kind.

This destination of the money, it was conceived, would be highly acceptable to all the associations now established, and further, would tend in a direct manner, to pave the way for that improved system, which it is the anxious wish of the Central Board to patronize and introduce. They agreed also to distribute medals for the promotion of particular purposes; and in the younger and ruder settlements to give seeds as agricultural premiums. It was also anticipated, and justly, too, that the six great objects to be encouraged more especially this season might not be equally compatible with the local circumstances of the different societies; and for that reason a representation by any of them is open to the Board, stating the grounds of their inability to contend for specific premiums, and proposing something else in their room. Annapolis, for instance, cannot compete with regard to lime, as that fossil has not yet been discovered in the county; but the society there may correspond with the secretary here, and suggest in what manner and for what purposes the prizes so appropriated may be destined; and it is requested that all such objections be adduced immediately, that the new appointments be definitely arranged during the course of next month.

With these explanations the committee hereby offer under the head of

SUMMER FALLOW,

For the first prize, a double drill plough, combining in one instrument the movable mould-boards and weeding apparatus; for the second, a double mould-board plough only, without the weeding appendage.

No farmer can compete for either of these prizes unless he place under fallow at least five acres and break up the land, for the first time, on or before the month of June. Besides, there must be other two ploughings during the summer and fall, and three turns of the

harrows in the interval of these operations. If winter-wheat be sown, the candidate may immediately after put in his claim ; but if he prefer spring-wheat, the land must be stirred a fourth time previous to the reception of the seed. The prizes will be assigned to whoever cultivates in this way the greatest number of acres.

FOR OATS

There are also two prizes to be given ; and no competition can exist on this point either for less than 5 acres. It is necessary to call the attention of the societies to this matter, and warn them against error ; for although they were to return two of their members as claiming the premiums held out—the one, we shall suppose, for four acres, the other for three and a half, both would be rejected ; for the prizes cannot be won otherwise than by extending the culture to the above quantity.

The first will be a common chain plough, made on the best construction, and will be delivered to the person who produces the heaviest bushel of oats, which shall be deemed a fair sample representing the average weight of the crop.

The second prize will be a drill barrow with appropriate rollers, and will be assigned to him who sows the greatest number of acres within the bounds of each society.

FOR TURNIPS,

The committee thought it advisable, in the existing state of our husbandry, to lower the rate of competition to two acres in place of five ; but these must be cultivated in drills according to the most approved system, and may contain either the yellow, white, globe, red-top, or Swedish kinds.

The first prize shall belong to the farmer who raises the greatest weight of bulbs and tops upon an acre ; and this can be easily determined by two judges commissioned by the society to proceed to the ground, and there select two or three square rods in separate parts of the field, which they shall consider as a fair average ; and weigh the contents of these, as a common standard by which to estimate the rest. Not less than 70 tons upon a single acre could gain such a prize in England ; and the returns from the different counties will enable us to institute a comparison between our husbandry, and that of the mother country. For this, a drill weeding plough shall be given.

The second prize will be a double mould board plough, and will be conferred on the person who cultivates the greatest number of acres according to the drill system.

FOR LIME

Two prizes are also appropriated ; and will consist of the most approved harrows. The judges here will estimate the bushels as they come from the kiln, in an unslacked state ; and no competition is admissible under two hundred such bushels. The prizes will be given to such as apply to land during either this spring, the summer or

ensuing fall, the greatest quantity in the county. It is expected, that enterprising farmers, where lime is attainable, will strain at burning a thousand bushels which will be barely adequate for ten acres of summer-fallow; and to this purpose, or to newly cleared lands, the lime should be chiefly appropriated.

FOR FELLING THE FOREST.

The committee were satisfied, that they could not, from the present funds, set aside such prizes as might be competent rewards for this exertion of industry—so closely connected with the growing prosperity of the province; but, in order to give it their utmost countenance, it was proposed to strike four silver medals, differing in value, and to bestow these, with suitable devices and inscriptions, on the successful competitors of each society; and moreover, that none of these should be given for less than five acres. It was also the sense of the committee that the operations undertaken to gain these prizes should be limited as to the time of commencement; and accordingly, they fixed on March last. The country societies will therefore admit all claimants who began to cut the forest at that period, or afterwards, and who shall continue to follow up the other parts of the process till the fall of 1820. At that time, when the seed is committed to the earth, the competitors shall give in their pretensions, and the medals shall be distributed among those who have improved the greatest number of acres.

THE PLOUGHING MATCHES.

Three silver medals are meant to be cast, and given to the best ploughmen in each district. The different societies will arrange the time in which the exhibitions of skill are to take place, the nature of the teams to be admitted, whether horses or oxen; and such other circumstances as may be dictated by the peculiar habits of the county. It is likewise strongly recommended to the societies, that they give encouragement from their own funds to these matches, and appoint such with appropriate premiums in order to rouse an ardent spirit of emulation.

It is abundantly plain that the sums allotted to the minor societies cannot reach all these objects, nor provide these premiums; and therefore the Board shall substitute seeds in place of the more expensive implements, and only consider itself bound to account to each for the respective sums affixed to their names.

GENERAL RULES AND TERMS OF COMPETITION.

I. For the prizes now announced, competition is open to every farmer residing within the county or settlement wherein an association is formed; but the very circumstances of his claiming this right, subjects him to the necessity of becoming forthwith a member and subscribing the rules. Should he be inadmissible according to the acknowledged regulations of the society, that defect in his title shall debar him from entering the lists, for it is not the design of the Board to infringe the private constitution of the societies with regard to the admission of

their members, and none but members can share the benefits of this institution. The indulgence shown to farmers this year in point of right of competition will most probably be denied them the next; and therefore every respectable freeholder should, without delay, unite himself to the association in his neighbourhood.

II. The different societies shall appoint the judges within their bounds for the decision of prizes, and examine and adjust opposite and conflicting pretensions.

III. In the event of indifference on the part of the members of any association about exerting themselves in agricultural pursuits to gain these prizes, the sums destined for providing them shall revert to the funds of the Provincial Board, and no after claim from the district or county is competent on any ground whatever.

IV. The secretaries of all the societies throughout the province shall transmit to the Provincial Secretary an authentic list of the candidates—successful and unsuccessful—for the different premiums, that a record may be preserved by which to determine our advancing or declining husbandry. This will become a sure test whether any advantage will flow from the present diffused agricultural spirit.

V. The appropriate premiums shall be delivered by the Board to such claimants as present to its secretary a certificate signed by the president, and countersigned by the secretary, of each individual society.

The Board has received from New York a small quantity of seeds—consisting of spring rye, LeRoy's spring wheat, brown top grass, red clover, mangel wurtzel and onion seeds, which are meant for distribution at cost price among the different societies that apply, and to which such accommodation may be acceptable. The Governor has given by way of donation, in aid of the funds of the Provincial Institution, sixty bushels of Dalhousie, Angus, and potato oats, a proportion of which shall likewise be delivered to the societies; and all of these are now under the care of the secretary, and are ready to be forwarded by the first conveyances which occur. Add to this, that a considerable supply of potato oats, as well as of field turnip seed, is daily expected from Scotland, and these on their arrival will be distributed also throughout the province. It may be proper, once for all, to state for the information of the public, that the Provincial Secretary, considering itself as acting for behoof of the agricultural interest, concluded that this great end would be more effectually accomplished by selling out without profit the seeds that might be imported, and thus preserving inviolate its funds created by the generous bounty of the subscribers, than by dissipating them at once in a gratuitous and indiscriminate division, and thus depriving itself of the power of future usefulness. Its funds will at all times be consecrated to the promotion of our agriculture, but they must be husbanded with economy, that much may be achieved by moderate means.

JOHN YOUNG, Secretary.

April 23d, 1819.

RAWDON, April 17th, 1819.

SIR,—Being informed that you are appointed Secretary to the Central Society in Halifax, I beg leave to acquaint you, that in consequence of a notice circulated by the Rev. Wm. Twining, Rector of this place, a number of respectable farmers of this and the adjoining townships of Newport and Douglas met here on Tuesday last, and formed an Agricultural Society. Our distance from Windsor makes it inconvenient to attend the meetings of the Hants Society; and this is one reason of our acting independently and for ourselves.

I am directed to communicate to the Secretary of the Central Board our resolutions, and herewith enclose them in compliance with the desire of the society. I solicit the countenance and support of the Central Board, and the correspondence of its Secretary in our behalf.

I might mention that Mr. Twining has for some years contemplated an agricultural society here; but the letters of Agricola prepared us for this event. Our advantages in Rawdon are in many respects inferior to surrounding townships. We have neither marsh-land, interval, nor navigation; but we have good tracts of upland, and perhaps few settlements in the province are more capable of tillage. Limestone does not abound—only in one place has it yet been found, and that on the western extremity. Of late, considerable exertions have been made to better our condition, and one person, Mr. Benjamin Carey, has upwards of 30 acres of land, partly in winter grain, and partly ready to be sown this spring, and I have myself 30 acres cut this winter.

Permit me, Sir, to offer you the thanks of the community of which I am a member, for your patriotic exertions to arouse us from the lethargy in which we were sunk, and I hope you will yet see your endeavours crowned with the wished for success.

I remain, Sir, in behalf of the Society, very respectfully yours,

GEORGE GAULD, Secretary.

Mr. John Young, Halifax.

At a meeting held at Rawdon, county of Hants, on the 13th day of April, 1819, for the purpose of considering the proposal of the Rev. William Twining, for forming Rawdon and the adjoining townships of Newport and Douglas into an Agricultural Society—James Moxon, Esq., in the chair, the following resolutions were moved and agreed to:

Resolved,—That the persons present shall form an Agricultural Society, the object of which will be to improve the mode of agriculture in the above mentioned townships by every means in their power.

Resolved,—That the officers of the society shall be a president, three vice-presidents, a treasurer, and secretary; and that a committee of persons from each township shall manage the business of the society, who shall be elected annually.

Resolved,—That William Smith, Esquire, be President.

William Wier, Senr.
Samuel Meek, of Rawdon, and } be Vice-Presidents.
Richard Smith, of Douglas.

That James Moxon, Esq., be Treasurer, and
George G. Gauld, Secretary.

Resolved,—That the Society shall meet quarterly at such places as may be most convenient for the members after the first meeting, which shall be in Rawdon on the third Tuesday of June next.

Resolved,—That the annual subscription shall be ten shillings—to be paid half yearly—the first payment to be made at the next meeting.

Resolved,—That the secretary communicate to the secretary of the Central Society in Halifax the proceedings of this meeting, and solicit their support and patronage.

Resolved,—That a copy of the resolutions be immediately sent by the secretary to such persons in these settlements as may circulate the same as widely as possible.

JAMES MOXON, Chairman.

REMARKS.

I have long expected the formation of a society at Rawdon, and I regret that it was not constituted before the distribution of the seeds. It will be impossibe for the Provincial Board to give the new societies for this season the same privileges as the old, because on account of the rapid advance of the spring a principle of division was necessary to be adopted, and that could only comprehend such associations as were already in action. To have left seeds in reserve for societies that might never have been erected, would have been impolitic because it might have been fruitless; and hence all such expectations on their part must for this year be abandoned. It is some consolation to reflect that £100 are set aside to purchase prizes for the encouragement of future minor societies, which will be equally shared among them to the extent of £20 each, unless more than five start into existence; in which case the amount will be parcelled among them by an equitable scale of division. In the meantime the Rawdon Society will turn its attention to the agricultural premiums, and set about with spirit and alacrity to contend for them according to the capability and means of the members.

All the seeds destined for the 14 societies are now ready to be delivered, and the secretary is availing himself of suitable opportunities to dispatch them; but as some of these are in remote situations it is requested that they also be active in sending for them, that no ultimate disappointment may take place. Those belonging to Pictou, Colchester, King's and Union King's County Societies are shipped.

The seeds for Sydney and Hants will be forwarded to-day; the first by a vessel of Mr. Cutler's to Manchester, the second by a private team. For the other eight societies no opportunity has offered, and it is hoped persons having an interest in the forwarding of these seeds will take the trouble of calling for them.

JOHN YOUNG, Secretary.

Halifax, April 29th, 1819.

TO CORRESPONDENTS.

I shall next week commence my series of letters which have been so long interrupted, and I beg of my friends again to renew their valuable and useful correspondence whence I derived so much light in the former part of my course. The fifth section of the Synopsis falls to be illustrated, which treats of the natural hindrances in the soil that are preventive of tillage, and which must be removed by human labour to make way for the plough.

AGRICOLA.

Halifax, April 30.

No. 33.

ON THE NATURAL OBSTRUCTIONS IN THE SOIL.

MAN, from the physical circumstances with which he is encompassed, is obviously designed for the exercise of more of his active than of his intellectual powers. The rude materials on which he is to operate are strewed around with a bountiful profusion, but they are neither fashioned to his use nor anywise fitted for ministering to his pleasure. The purposes to which they can be applied must be found out by the blundering chances of invention, and the manner in which they are to be wrought up as the instruments of luxury and enjoyment is the fruit of patient and incessant industry exerted through a series of ages. The naked and trembling savage surveys the rugged and unpolished features of nature with a stupid amazement, and foresees not that in the progress of improvement his more intelligent offspring are destined to subdue the unprofitable luxuriance of the forest, to drain the noisome and unhealthy fen, to level the inequalities of the surface, and to collect and pile the stones which infest and cumber the ground into durable and sheltering fences.

It would not even be accounted a philosphical paradox to maintain, notwithstanding its repugnance to some modern theories, that our intellectual capacities are subordinate to our active, and derive their principal use and dignity from the lights they afford in the direction of human conduct, and in the advancement of those vulgar as well as polite arts that serve to the necessities and adornment of life. In accordance to this general doctrine the merit of all pure speculation is tried by the standard of utility, and it is on all hands allowed to be a mere perversion of intellect to dive into researches that have no practical tendency. Every new system of science sets out, not only with defending the soundness of its views and the legitimacy of its reasoning, but with displaying studiously its happier application to the business of the world. Without these pretensions it could not be admitted to an audience, far less to the benefit of a careful and laborious investigation; and consequently its framers or patrons comply with the general sense of mankind, and point out the close connection it holds with those active pursuits that lead to glory, independence or wealth.

The advantages of husbandry need no studied or high-wrought panegyric; and this art, in the first as in the more advanced stages of society, preserves an acknowledged pre-eminence, and is universally admitted to be at once the most healthy, the most delightful, and the most profitable employment of human labour. Here our active powers find full scope for exertion, and must needs call in the aid of the understanding to guide and direct them. There are obstacles to be surmounted by perseverance, as well as ends to be effected by superior skill; and the union of activity and intellect is nowhere more apparent than in the cultivation of the earth.

The bread which we must eat at all times and under all circumstances, "be earned by the sweat of the brow." This holds true in the rich and cultured plains of the old as in the desolate and cheerless wilds of the new world, although in the latter the means of subsistence, notwithstanding all natural difficulties, are more easily obtained, and a more liberal recompense is bestowed on labour. A few years of toil secure for a new settler lasting independence; and the discomforts attendant of the clearing of the forest, and the privations inseparably allied to such a state, are more than overpaid in the returns of the first or at most the second crop, in the increased value of the land, and in the consciousness of being the lord of the soil.

The obstructions to the improvement of land divide themselves into two great classes:—Those which depend on the institutions and political laws of the country, and those which arise from the impediments presented by nature. The first have been perniciously operative throughout the whole of Europe in fettering or at least retarding the progress of agricultural melioration, and tracts have continued for generations in a waste and unproductive condition, either from the arbitrary and oppressive influence of the kingly or aristocratic authority, or from the rights of servitude acquired by certain orders in the nonage of society, and before the principles of political economy were either studied or understood. England, during the last century, has been busied in extricating her agriculture from the thraldom in which it was entangled, and even yet much is to be accomplished before the chains of its degradations and bondage can be finally struck off. Obstacles of this nature are slowly and with much difficulty removed, because they are interwoven into the very frame of the government, and are fortified by all the prejudices of a remote antiquity. The privileged orders in the state, whose rank and consequence co-exist with such abuses, must be hostile to every measure of reform, and will naturally bestir themselves against innovations which menace the permanence of their power. Without dwelling on the illustration of these evils, as they have broken out in different kingdoms, I shall cursorily remark that the rights of primogeniture, the laws of entail, the system of villainage, the want or insecurity of leases, extensive commons, tithes, poor-rates have, one or all, damped the spirit of enterprise, and degraded European husbandry since the downfall of the Roman Empire. Although improvement on the whole has been progressive, this has been carried forward rather by the impulse of a growing population and the natural disposition of society to better its affairs than by the positive enactments of an enlightened and provident legislation. Happily for us in this province we labour under no such embarrassments. There is not a single circumstance in the structure of our government, in the operation of our laws, in the subordination and arrangement of society, that can be styled unfriendly to our rapid progression in all the arts conducive to domestic prosperity. Our legislature has expended since the origin of the colony, and that wisely, the most of the revenue in the repair and formation of roads; the lands are not sold, but gifted by the crown; we

are almost totally exempt from taxation ; Great Britain, with a paternal and perhaps too liberal generosity, defrays the expenses of our naval and military establishments ; we are protected in the possession of our liberties and interests, as well by inheriting the blessings of the British constitution, as by the upright and impartial administration of justice ; we have no nobility to claim the soil by birthright and apportion it out among vassals and retainers ; no priesthood to exact tithes on the pretence of a divine and indefeasible right ; no paupers to eat, like canker, into the vitals of industry ; but we have independent freeholders, who are attached to the soil—a mixed and intelligent clergy who bury the distinctions of sect and the rancour of intolerance in the common grave of brotherly love and charity—and a hardy and high-minded peasantry who though although far from affluent would despise the meanness of beggary.

Since we have no political, what then are the natural obstructions to our agriculture which have so long humbled the colony, and kept it dependent on a foreign supply of grain ? It would be a profanation of the gifts of Providence to rank among these our climate, for it is more than amply sufficient for ripening all bread corn, and perfecting whatever is essential to the maintenance of life. *Farmers are now living, who for forty years have regularly and annually harvested, in full maturity, wheat, rye, oats, and barley ; and who during that long period have lost only one crop of wheat from causes attributable to climate. Neither is it our soil which entails upon us this abject and ruinous dependence, for no country can boast of a greater abundance of fine loams or of a more liberal proportion of fertile interval and dyke lands. True, on the Atlantic we have a bold and rugged coast, strengthened by an iron and rocky stratification as if to oppose the incessant fury of the ocean—and in that quarter a thin and hungry soil, ungrateful of return, offends the eye and but ill requites the labour of the husbandman ; yet this portion of inferior land is nothing compared with the extent of our level plains and of our rich and inexhaustible marshes. Nature has dispensed a full share of her favours, not only in the geographical lineaments, but in the capabilities of the province. Here she has neither reared the healthy and abrupt mountain nor stretched the sterile and sandy barren, but has blended in sweet assemblage the characters of beauty and exuberance over the whole of the interior. She has encompassed us on all hands with seas, and indented our border with inlets, basins, and navigable rivers—that every facility might be afforded to our comfort and convenience. We have, in fine, no difficulties to contend with save those natural hindrances which are met with in every new country, and which can be removed by moderate industry and limited capital.

These are reducible to four heads which I shall treat in order, and draw from them some practical inferences that ought to invigorate

*John Allen, Esquire, of Newport, asserts that for thirty-nine years he has been successful in ripening all the grain on his own farm, except once, when he lost a crop of wheat, and many of his neighbours have been equally fortunate.

enterprize, and which naturally open the most enlivening prospects. The obstructions are—the trees of the forest—the inequalities of the surface—the stones and rocks which are occasionally interspersed throughout the ground—and lastly the springs and wetness which abound every where, till they are carried off by a proper system of draining. It is but seldom that these unite in the same spot as barriers to the operations of the improver, and when this happens, it is chiefly on the southern margin of the Province; but in the interior, and along the whole course of the Bay of Fundy with its numerous windings and creeks, as well as in the eastern division along the Gulf of the St. Lawrence, the great body of the surface consists of a friable mould free from stones, and is either level or undulates gently into hill and valley. So devoid of all rocky materials is the superficies, that in several districts, and these of considerable magnitude, a real scarcity of stones is felt for the necessary purposes of building and fencing; and the settler in these situations meets with no obstacles, other than the lofty and aged trees which have held, in all the stages of their growth and decline, undisputed possession of the soil.

The expense of cutting down and removing these varies a little in different districts of the Province; and this arises, not only from the state of labour, but also and principally from the nature and magnitude of the timber. Of all our lands which require the use of the axe, the intervals skirting the rivers, are at once the most easily cleared. Our deep loamy plains, of which there is a vast extent, particularly in the eastern interior of the Province, are next in order; and upon them grow the majestic beech, the stately maple, the white and yellow pine, intermixed with the ash and the hemlock. These are trees of lofty growth which shoot into the air, and form above an umbrageous covering so thick and luxuriantly spread as to intercept the rays of the sun, and exclude the kindly influence of the heavens. Under their shade the more humble shrubs perish; and the ground is denuded of every tangled incumbrance. You can walk amidst their trunks without being retarded or annoyed with brushwood; and this circumstance of itself is an infallible index of the goodness of the soil. On poorer lands you encounter the intertwined thicket, overshadowed by the limber poplar, the white and grey birch, and the slender and worthless spruce and fir trees. As far as the cutting down of the forest is concerned, the labour seems to be in the inverse ratio of the value and intrinsic excellence of the soil. The expense of clearing cold, strong, stiff clays where the dwarfish fir scarcely vegetates, or the rocky barren where the roots creep along the surface and dip into the clefts in quest of vegetable mould, is infinitely greater than what suffices for the wooded interval or the loamy upland, where flourishes the hard timber of generous and luxuriant growth.

It is superfluous to descend to particulars regarding the various items of expense which are incurred in the separate operations of cutting, rolling, burning, and of ultimately inclosing and sowing the new land, as these are familiar to every settler, and fluctuate according to

circumstances between £4 18 and £6 15 per English acre. The lowest calculation furnished by any of my correspondents is the first of these sums, and the highest is £6 14; and these are transmitted from the opposite extremities of the Province, and may hence be considered as the limits between which the truth ranges. This outlay falls short of the sum frequently expended by the British tenant on an improving lease; and no farmer of capital would hesitate a moment to embark in an undertaking so little hazardous. The stumps, it is true, still remain to perplex the future operations; and additional labor is requisite to tear these up by the roots. This cannot be accomplished but after the lapse of several years, and till time has consumed into rottenness the ligneous fibres, which cleave so firmly to the ground as to forbid all attempts at immediate eradication. The periods of decay peculiar to the roots of different trees extend from six to fifteen years; and those of a few species, such as the heavy black birch and hemlock, brave all the alternations and vicissitudes of the seasons for twenty. Generally speaking, however, land may be partially disencumbered at the end of the first seven years; and although some of the more durable stumps cannot then be uprooted, so many can be removed as to admit the plough for a second grain crop. Two pair of oxen with an iron chain are usually employed to tear them out; and the expense of this second clearing may be estimated at about forty shillings. The half of this sum more, expended at different intervals during the succeeding years, will entirely relieve the soil and prepare it for being subjected to a regular course of culture. Thus, the moderate outlay of ten pounds per acre, applied with judgment and economy, will amply suffice for reclaiming the wilderness, from the first stroke of the hatchet till its final and complete subjugation under the plough. This is the one side of the account; we shall now turn to the other.

There are only two ways in which new lands are generally managed. The first is to employ the Fall and Winter in felling the trees, and afterwards cutting them into moderate lengths that they may be more conveniently handled. In the ensuing Spring fire is applied which, as the summer fervours have not yet exhaled from the branches, twigs, and leaves their vegetable moisture, burns them imperfectly, and penetrates but a little way into the soil. The trunk and arms, which are never fully consumed in this first process, are afterwards rolled and collected together into heaps, and again set on fire to reduce them to ashes. If these different operations can be hastened over by June, either turnips are sown or potatoes planted, to obtain a crop during the same season. In several parts of the Province this mode of conducting matters has prevailed, but chiefly among those indigent emigrants who with difficulty have outlived the preceding winter, and are compelled by dire necessity to provide the immediate means of subsistence

But this is considered as both an injudicious and unprofitable plan of management; and is seldom resorted to by the old settlers who are in circumstances to obey the dictates of more matured experience. These defer the burning of the felled timber till after mid-summer,

when the solar heats have made preparation for the fire, which in that case performs its office with a more thorough effect. The whole season is occupied in the different processes, and towards the Fall, winter wheat or rye, mixed with grass seeds, is sown; and the first crop, in nineteen cases out of twenty, repays the full expenditure of improvement. The capital of the farmer is restored to him, as he can safely calculate on ten or twelve bushels of grain; although many often reap a much larger quantity. The restoration of his capital furnishes him with the means of further improvement; and an hundred pounds—sacredly appropriated to this purpose and not diverted from it by any wild and mischievous project of commercial speculation—would work miraculously, and in the hands of an industrious man lay the foundation of an ample and independent fortune in land. Although the first year's crop fall short of the entire and full reproduction of the outlay, it is acknowledged in every quarter of the Province and almost without a dissenting voice, that the hay of the second year will certainly replace it; and that there is no instance, under the conduct of a prudent and skilful improver, where he needs to draw, for the purpose of making up the deficiency, on the third crop. Its value, whatever that may be, as well as all the future products of the land, becomes net profit, and goes to the accumulation of stock. On the sixth or seventh year, when the tenderer stumps are ready to be eradicated, the trifling expense of pulling them out is reimbursed fourfold by the grain; so that the future outgoings of every description never afterwards affect the favourable balance of the profit and loss account.

What causes then are in existence to operate our agricultural depression; and whence the difficulty felt in producing a sufficiency of bread corn? These questions may be easily solved by marking and recounting the history of the emigrant population, by which this colony has from time to time been settled. Men, driven from home by the pressure of want and not infrequently allured by the glitter of false and interested reports, disembark on this foreign strand, their imaginations teeming the meanwhile with wild and impracticable visions. Conceiving that lands here bear some relation in value to the inclosed and fertile fields of their native country, they indulge in golden dreams of immediate ease and independence; till the sad reality bursts on their astonished and awakened senses. They behold, for the first time in its true light, a wilderness of stern and forbidding feature, which is to be subdued by long and continued efforts of painful application. Unfitted by their former habits for the many privations to which they must submit, and impatient of the hardships which are inevitable, they plunge into the forest without skill, without capital, and almost without hope. They must rear a miserable cottage by which to shelter themselves from the inclemency of the coming winter; and if their means fail not, a barn to protect the half famished and shivering cow, from which they are to draw their principal subsistence. These beginnings of a new settlement, or, as it is vulgarly called here, of making a farm, generally leave them pennyless; and with minds

soured by disappointment, their future exertions, in place of being directed by vigorous and enlightened calculation, are committed to the hazards of blind and capricious accident. They drag on a wretched existence under the benumbing influence of poverty, and seldom can resist the temptation of running into debt. The produce of all their after improvements is anticipated in the purchase of some little necessaries always at an extravagant rate; and this, which they account an evil and attribute to the rapacity of the merchant, grows out of his uncertainty and risk of regular returns. From such a race and so circumstanced, it is vain to expect enterprizing activity. They want capital—the vivifying soul of improvement, and the grand instrument of industry; and we have not in the whole Province a public bank, which by the distribution of judicious loans might aid the careful and persevering. Although our agricultural population are strangers to squalid indigence, and in general can command the simple articles of living, we have settlements, and these of considerable importance and of long standing, where the pittance of five pounds in money could not be scraped together from an hundred families. There is no such poverty known in England; and capital there is accounted as indispensable to farming as to mercantile speculation. The whole sum necessary here to clear an acre, and which is repaid by the very first crop, falls short of the yearly expenses incurred by every ordinary tenant in his summer-fallow and subsequent liming. It is a fixed maxim at home, that no man can engage in a lease without the possession of a circulating capital treble the amount of the rent; and should he be so indiscreet as to enter on it with scantier means, he is sure of being embarrassed; and from his incapacity of working the land to advantage, ten to one but he is ejected by some ruinous process of law. On the contrary, here our farming operations are often commenced in poverty, and conducted throughout under its paralizing influence. I should like to behold a man of moderate wealth and skill, acquainted with the habits of the country, a judge of soil and situation, embarking in an extensive scheme of improvement. The cutting down of twenty acres annually would make a deep and perceptible incision on the forest, and in the endurance of a common lease in Great Britain, would create a property upon which might be reared the most lasting independence. The sum of two hundred pounds is able to meet all the contingencies of this undertaking; and I am satisfied that no investment of money in fisheries, in commerce or in West-India shipping, would yield an equal profit to the individual, or be half so beneficial to the public.

Indeed, were the nature of this Province better known in Britain, the overabundant agricultural capital, which is struggling there under difficulties and severe exactions, and which could find here a profitable and safe investment, might be expected to flow this way in a very strong current. To elevate our husbandry to the most enviable pitch, we need little else save capital and skill. For the want of the first, our best lands are in a state of neglect; and of the second, the worst modes of management have prevailed to a pernicious extent. Of this

there are no more convincing proofs than the present condition and marketable value of our marshes. These tracts are equal, if not superior in fertility, to the celebrated Scotch CARSES of Gowrie, Falkirk and Stirling; and to the water-formed lands in England, which border on the many rivers emptying themselves into the Humber, and up which the tide has flown for past ages, depositing along their banks that rich alluvion which is the basis of the soil. We have a great many thousand acres of this description in Windsor, Newport, Falmouth, Horton, Cornwallis, Annapolis, Londonderry, Colchester and Parrsborough; and at the head of the Bay of Fundy, seventy thousand acres in one body; all which have been originally gained from the sea, and are preserved from it now by regular lines of embankment. The manner of cultivating these lands, since the origin of the colony, has been to break them up, and sow Spring wheat in April or May on one furrow. The next year, wheat is again sown in a similar manner, and in many instances has been repeated a third time. After this severe cropping they are abandoned, and suffered to repair and cover themselves by the natural grasses; for to sow them down with timothy and clover is a vast effort, and considered as a mark of very superior husbandry. In this state they lie for five or seven years, and are invariably mown; and the hay is carried off for supporting the stock during winter. In no part of the course, either when under the plough or when in grass, is any sort of manure applied to them. This system has been pursued for sixty or seventy years; and these noble lands have been neither summer-fallowed, limed, dunged nor warped. The second crop of wheat is always superior to the first, and to the third also when it is taken; and the average produce per acre may be reckoned at from twenty to thirty bushels. The hay crop again varies from one and a half to three tons; and so congenial is the soil to the clovers that both the white and the red spring up after the ploughings, although none of their seeds have been sown. Of such exuberant richness are these marshes, that an opinion of their inexhaustibility has long passed current; and many of their owners cannot be convinced that manure is of the least service. At all events, none has been administered since they came into the possession of the British although both the white and green crops, by being carried off, have been of an impoverishing tendency.

Those lands can, at the present day, be purchased readily for £25 currency per acre; and in Cumberland and the adjoining province in particular, they lie in such extensive masses, that farms of from two to ten hundred acres in one allotment can be procured. Upon these there is neither a stump nor a stone to be found; and the depth of the soil is far more than sufficient for all the ends of tillage. The annual expense of the sea dikes is a mere trifle per acre; for when skilfully constructed they last for generations with very slight repairs. The

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When we rise from these to our uplands—a term employed to denote all those tracts, which are placed beyond the reach of the tide and of the vernal and autumnal flow of our rivers—and which constitute eight-tenths of the whole superficies of the country, we are no less struck with the evident marks of a want of capital in our Agriculture. A grant of two hundred acres covered with the forest can be obtained from the crown by any settler, by paying the fees of office and the survey, which together amount to £12 10; but as five may unite in obtaining a grant, the expense on each lot will not exceed three pounds. But farms of that kind can always be bought at market, having a tolerable good house and barn, and from thirty to fifty acres cleared and capable of being tilled, as low as £150 to £200—sums not greater for the fee-simple, than would be given for such farms as annual rent in Scotland. Fifty acres of arable land, with no great accommodation of buildings are let in all parts of the mother country, at from £3 to £4 yearly per acre: while here this amount is only required for the full acquisition of the property; and yet buyers are so few compared with the sellers, that real estate is rapidly on the decline. This arises from the facility with which grants can be obtained; and from the rage of our population to make a new settlement in the forest, rather than to cultivate an old one.

The emigrants that arrive here, too, are from the dregs of society, and have scarcely a shilling left when the expense of their passage is paid. But were a better class of farmers to resort to this country, possessed of moderate capital, of steady habits and of ordinary skill in their profession, they could not fail at once to enjoy competence, and to render themselves and their children in a short time independent. Our great public roads throughout the whole of the Province are in excellent condition, practicable for waggon, cart or carriage, and only inferior to those of Britain in the durability of the materials of which they are formed; while the prices of our produce are fully as high as at home. Beef on an average throughout the year, commands 6d. per pound of 16 ounces; and veal, mutton, pork are in proportion. Wheat is at 8s. and 9s. per Winchester bushel; barley at 4s. and 4s.6d.; and oats from 2s.6d. to 3s. Eggs may be quoted at 1s. per doz; butter at 10d. to 13d. per pound according to the season; and poultry fully as dear as in the market towns of England.

With respect to our climate there are the same inducements to vest capital in the country. About Christmas the winter usually sets in with a heavy fall of snow; and so steady is the frost, that the ground remains covered to the end of March to the depth of from one to two feet. During the whole winter the roads are so smooth and glassy, that ponderous loads can be transported on sleds which run on the snow, with a much less expense of animal labour than at any other period of the year; and this is the season which the farmer lays hold of to provide his fuel and fencing, to repair to distant markets, and latterly to haul his limestone. The spring opens in April, and during that month oats and wheat are committed to the earth: in May Indian corn and potatoes are planted, and this latter root will yield a full crop although postponed to the twentieth of June: barley and buckwheat are sown in the end of May or early in June: and turnips are usually drilled not sooner than the sixteenth, nor later than the twenty-sixth of July. Our reaping begins in August and is finished in September; October is occupied in lifting the potatoes; and November in securing the turnips. During the whole autumn, from the beginning of September to that of December, we are blessed with a delightful tract of weather—the sky serene and unclouded—the roads dry—and the plough may be in perpetual motion.

Such is a true portraiture of this Province, where Agriculture is in its infancy; where lands are amazingly cheap, although the soil be fertile and the climate inviting; and where the farming classes, taking all circumstances into account, may live in more ease and comfort than in most other portions of the British empire.

AGRICOLA.

Halifax, May 8, 1819.

TO CORRESPONDENTS.

Although much pressing matter lies beside me for publication, I must complain that there is a great falling off, since the intermission of my course, in the number and value of my communications. When I am about to recommence my letters, and pursue the system sketched in the synopsis, I must again draw liberally on the goodness and information of my friends: and I now solicit, in behalf of my future, that unsought patronage which distinguished my past labours.

I cannot resist this opportunity of my public acknowledgments for the aid and indulgence I received as an anonymous writer; and now, when the secret is disclosed, I shall stand more than ever in need of generous support; more especially as I am about to attempt what is without precedent in the literature of England—to address a community weekly as a known character—to praise and blame—to instruct, to exhort, often to command. That these letters may be consistent and of a piece, they will be continued under the signature of AGRICOLA: but correspondents who wish to throw light on the subject-matter may

address me as secretary. I owe many obligations to Dr. Wm. Petrie during my concealment, for delivering and conveying all my letters, and for frequently giving me important help in the execution of my plan.

JOHN YOUNG, Secretary.

STEWIACK, April 30th, 1819.

SIR:

Agreeably to your recommendation, a meeting of the freeholders and farmers was yesterday held in this place; and although the notice was short and the time busy, yet a respectable attendance was given. The report of the transactions of the Provincial Agricultural Society at their last meeting was read as an introduction to the business of the day. This being done, it was unanimously agreed upon and resolved —That an Agricultural Society should be instituted and formed in this place, upon similar principles and with similar objects in view.

Office bearers and a committee of management were elected; nine resolutions and rules were adopted and subscribed by twenty members.

The office bearers for the present year are:

Samuel Tupper, Esq., President.
Abraham Newcomb, Esq., Vice-President.
Reverend Hugh Graham, Secretary.
Mr. Robert Gammel, Treasurer.

COMMITTEE:—Francis Creilman, William Rutherford, Robert Whidden, Eliakim Tupper, James Fulton, Hugh Dunlap, Robert Logan, George Rutherford.

As the list of members is as yet incomplete, I do not think it worth while to transmit it. The subscription paper is in circulation; and from the spirit displayed at the meeting and the general good sense of the people, I have not a doubt but that our members will come up to and probably exceed your expectation.

The Society have agreed to take the ACADIAN RECORDER to circulate among them for the sake of its agricultural intelligence; the treasurer has also proposed to take one for himself and neighbours; and when the inhabitants of Middle Stewiack join us, we will have occasion for more.

We are to correspond with other societies, and in particular with the Central Board in Halifax.

Your goodness will make allowances for the imperfections of our proceedings and this communication. Meanwhile, I remain your sincere friend and humble servant,

HUGH GRAHAM,

Secretary of the Stewiack Agricultural Society.

Mr. Young, Secretary of the Provincial Society, Halifax.

REMARKS.

Every fresh instance of that excited and ardent spirit which has now nearly pervaded the whole Province, must be pleasing to the patrons of our Agriculture. Stewiack is highly eligible for the establishment of a society, as it contains a great extent of cleared interval, well calculated for the new husbandry, and comprehends within its boundary not less than two hundred families. This association will be justly entitled to a share of the reserved hundred pounds; and I solicit the farmers, who may unite themselves to the society and subscribe its rules, to turn their attention to the six grand objects for which the premiums are offered by the Central Board; namely—summer fallow —the culture of oats—and of turnips—lime which is obtainable at no great distance from the river that flows through the settlement—the clearing of new lands—and ploughing matches.

It may be necessary to remark, for the information of the Province, that the committee has ordered two hundred copies, containing the nature and object of the prizes, the rules of competition and all other particulars, to be printed with a view to distribution; and these have been forwarded along with the seeds to different quarters. A few are still on hand, and the new associations may be furnished with these, in order to paste them up in public places for the information of the members.

I have also to announce that the articles and rules drawn up for the government of the Lunenburg Farmer Society, (I believe by the Reverend Roger Aitkin) met so entirely my approbation, that I caused some extra impressions to be struck off, and have bestowed them on the different societies as models to copy after. They are unquestionably the best which have fallen under my notice, and I recommend them as the ground-work upon which all others should be constructed. The discipline in them is severe, yet necessary, and will operate with powerful efficacy in changing the inveterate habits which our slovenly system has induced.

This week has been productive of two events proper to be known —the arrival of the agricultural machinery from Great Britain by the "Skeen," and the opening of a correspondence with the Agricultural Society in Quebec. These instruments are placed under the care of the secretary, for the inspection of all mechanics throughout the Province, and are accessible to the members of county and minor societies. They consist of ploughs and harrows of different descriptions, of a turnip machine for sowing two rows at a time, of a drill barrow with appropriate cylinders, of a large double field roller, and of a revolving brake-harrow.

The correspondence with the Agricultural Society in Quebec was commenced by ordering, through the medium of its secretary, two stallions of the true Canadian breed, to be shipped for Halifax in June or early in July.

JOHN YOUNG, Secretary.

Halifax, May 7th.

No. 34.

ON THE NATURAL OBSTRUCTIONS IN THE SOIL.

THE inequalities, with which the face of the earth is diversified, are some of them ornamental and useful, and others of an opposite and hurtful character. The innumerable ascents and declivities, the elevations and levels, and the variety of exposures to all parts of the heavens may be styled the genuine and characteristic features of a country, and form its principal charm and attractions. These irregularities of surface relieve the sameness of prospect; and while they give to a particular region, in some degree, the advantages of a difference of climate, they spread over it that shade and colouring so essential to the beautiful and picturesque. The principal figures, as it were, rise into life before the eye, seem to animate the crowded and busy landscape; and surprise and delight, as well by their unexpected and fantastic forms as by the endless variation of their tints. The hills become associated in the imagination with those memorable events of which they were the theatre, and the sight of them gives rise to a train of ideas which carry us back to other times, and are allied to melancholy or pleasure. These sensations of whatever kind awaken the attention of the beholder, work upon his feelings, and endear to him a country which recalls such lively and quickening recollections. The modern Italian derives a satisfaction from surveying the Alps—those gigantic barriers of his northern frontier—because from them once descended the *Cimbri and Teutones, who, after committing dreadful havoc, were vanquished by †Marius; and because, too, they were crossed by ‡Hannibal in that celebrated war which terminated in the ruin of Carthage.

But without recurring to ancient history for illustration, it is manifest that diversity of surface takes a stronger hold of the mind, and stirs up more powerfully the affections than a dead and unvaried level. The Netherlands, embracing all that flat country which borders on the mouth of the Rhine, although superior in soil and productiveness to any similar extent of Europe, are neither interesting nor lovely, and a traveller on their public roads is soon sated by the constant repetition of the same objects. The eye wanders round with impatience for something on which to repose, and sees nothing but the unbroken circle of the horizon. The phlegm of the Dutch character may with justice be ascribed to the evenness of their country, and neither sprightliness nor gaiety can be expected to dwell amid the insipid tranquility of such sombre, though luxuriant prospects.

Poetry, since the earliest records of her birth, has always been the "child of the mountain and the flood;" and the everchanging com-

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* Cæsar, book 2d, chapter 29th.

† Livy, vol. 4th, epitome 68th.

‡ Livy, vol. 2d, book 21st, chapter 36th.

plexion of rural nature has supplied her with that store of images which she has tastefully entwined into the texture of her verse. A tract covered with the forest exhibits throughout the same uniform appearance. Its features of beauty or deformity are shaded from the view, and they awake not those vivid and thrilling emotions which the unveiled countenance of Nature never fails to inspire. In Nova Scotia the emphatic and high-meaning words,

"This is my dear, my native land!"

can never be uttered with appropriate glow and enthusiasm till we can fully and uninterruptedly survey its general aspect, with its hills and dales, its ravines and glens, its rocks and caves, its springs and rills, its uplands and meadows, now hidden under an uninteresting mantle of foliage. The wilderness is a term of cheerless import, and involves whatever is repugnant to the human heart. When the lineaments of the country have become distinct and visible, it will win our affections and fix and consolidate our patriotism. Its rivers will be rendered sacred in song, its lakes will acquire interest from youthful and amorous adventure; its mountains will assume befitting names, and be distinguished by their minerals, their productions, or their prospects. And the ‖imagination, thus connecting with particular spots the alternations of pleasure and pain, of hope and fear, of depression and transport, will improve these into an attachment to the soil.

The unevenness and regularity, or the geographical character of a country seems to be more a matter of taste than of agricultural importance, and if we follow the dictates of reason and the decisions of sound experience, this inference offers itself as incontrovertible; yet men have arisen who, in compliance with theories which reigned for a time, have attempted to alter and disturb the form and figure of nature, and in place of drawing forth her simple beauties have tricked her out in false and meretricious ornaments. At one time, a preposterous taste prevailed in England of reducing every thing to the line and the level. The ornamental grounds around the seats of the nobility were tortured out of their just and natural proportions, hills were cut down and valleys filled up, walks were laid out in direct lines and turned at right angles, and the gentle bendings and swells of the landscape were disturbed and straightened by the officiousness of art. The trees were pruned into artificial monsters, incongruities were united without any regard to expense, and the fashion of the age was whimsical and vitiated.

About the period which extinguished the remains of Roman liberty, when the principal leaders in the State abused and violated for their own aggrandizement the free forms of the constitution, a like taste for unnatural and forced embellishments obtained in Italy. §The sums which, in the earlier ages of the commonwealth, were consecrated to public edifices and the temples of the Gods, were diverted to profane

‖See Allison on Taste.

§Horace, book 2d, ode 15th.

uses in adorning private villas and buildings. ¶Mountains were levelled and seas hemmed in to gratify a love of show and the cravings of a vicious luxury. But all pleasures which commit outrage on the works of nature, whether they arise in England or in Italy, are transient and perishable, and the good sense of mankind speedily corrects such errors, and restores a relish for simple and unadulterated decorations.

While some have thus striven to reduce the inequalities of the landscape, others, with a no less corrupt passion for novelty, have run into the opposite extreme, and represented artificial elevations as real improvements, because affording a larger surface for rearing the fruits of the earth. In June, 1812, the celebrated Joseph Lancaster, who has deservedly acquired fame for his benevolent exertions in another department, read a lecture in the presence of the Royal Dukes of Kent and Sussex, and other distinguished characters, on the application of geometry to Agriculture. **The object of the teacher was to devise means which might "largely contribute to employ the poor, to alleviate the misery of the manufacturer, and augment the quantum of food." The name of Lancaster, the mighty promise held out in his advertisement, the enlightened age in which the lecture was delivered, were circumstances that excited curiosity, and drew a full, and even noble and illustrious, auditory. The groundwork of his airy scheme was built on the observation that the superficial contents of a mountain much exceed those of the area on which it stands; and as it can be cultivated and clothed with verdure to the summit, an extension of superficies might easily be created by human labour. "In reducing this plan to practice, the farmer may choose an elevation of three feet in fifteen, which will give him one-fifth gain," for a ridge containing fifteeen feet, elevated three in the middle above the level, may easily stand on a breadth of twelve feet. When land has been formed on this or any similar regular method, "the elevation may be kept up and increased by ploughing." The stones which are often "cleared away at a great expense, may be buried on the spot, and thus tend further to accomplish the same end." That no doubt may remain as to the justness of the theory on which this project is founded, Mr. Lancaster endeavours to establish the point "of increased vegetation in regard to potatoes, peas and beans—as ten potatoes actually grew on an elevation of two feet, on a base of eight, while only eight such sets grew on the base itself."

Upon data such as these, which must be taken for granted, for they can never be proved in opposition to fact, Mr. Lancaster has reared as visionary a fabric as ever rose before a distempered imagination, and the just conclusion of his plan would be to form the plains of England into hills of decent size, that employment might be given to

¶ Sallust in Catalinæ Bello. "Num quid ea memorem, quæ nisi bis, qui videre, nemini credibilia sunt; a privatis compluribus subversos mentes, maria constrata esse."

** Farmer's Magazine, vol. 14, page 220.

the poor and additional subsistence raised for their support. He seems to have forgotten the natural perpendicularity of all vegetables, by which they shoot upwards at right angles to the horizon, and of consequence can imbibe no more of the atmospheric influences when growing on the sides than on the area of a mountain, and he has also overlooked the obvious danger of burying, in the course of the operation, the vegetable mould which lies on the surface, and which, from long exposure and cultivation, has been impregnated with fertilizing energy.

It may be laid down, on the one hand, as a general maxim which will admit of few exceptions, and these only in particular circumstances, that the natural structure of hollows and elevations which diversify the exterior of our globe must not be intermeddled with by art, because, while they constitute the principal traits of beauty they also modify climate and multiply its productions. On the other, it may be asserted that the artificial imitation of these inequalities is quite absurd and ridiculous, is a waste of human labour, and only sets the puny efforts of mortals in contrast with the mighty acts of omnipotence. The rule to "follow nature" may be perverted in the crazy brain of a wild projector, but if taken in its just acceptation it is as applicable in beautifying and cultivating the earth as in yielding to the bent of genius, and a violation of it in either case in invariably accompanied with disappointment and mortification. Whatever may be the aspect of any particular spot, although turned to the rudest quarter of the heavens, whatever its declination of surface, no attempt should be made to alter but only to improve it. A north or northeast exposure may be protected from the blast by a clump of trees, a regular shrubbery, or a lofty wall, and the brow of a hill may be softened down into an easy declivity, but the first should not be reversed, nor the last essayed to be levelled. The beauty of the universe is like that of the human figure. It consists of waving lines, of gentle prominences, of parts blended into harmonious symmetry; it argues perversion of taste to interfere with the proportions or forms of the living structure. They may be invested, adorned, improved, but every violence offered leads to debility, distortion, disease or death. The cramping of the feet of the fair sex in China, and the forming of artificial hills and valleys, originate in the same corrupted taste, and are equally deviations from chasteness and simplicity.

But there are inequalities of another kind which require the correcting hand of man, and fall within the remedies of good husbandry. These are the cavities which present themselves in every field reclaimed from the forest, as well as those risings which commonly pass by the name of CRADLE HILLS. Here it is customary, I know, to despise and overlook these inequalities, and I have witnessed enclosures, which to appearances must have been for years under the plough, where these vestiges of original rudeness obtruded on the view, and were the unequivocal marks of slovenly cultivation. Some even go so far as to defend them, and pretend to infer from experience that they are on the whole

beneficial; at all events that it is not worth while to bestow the time and labour requisite to produce an even surface, and that this is accomplished of itself by imperceptible gradations in a course of years. In opposition to all this I contend that these irregularities are positively hurtful, and that if we wish to distinguish ourselves by a rapid advance in improvement, we must provide the instruments and fall upon the means by which they are to be removed.

To a stranger who has never seen the first appearance of cleared wilderness land it is not easy to convey a distinct idea of what is meant by CRADLE HILLS, nor to account for the way in which the laws of matter acting on the surface have raised and formed them. Whatever may be the nature of the ground, whether champaign or mountainous, these hillocks, varying in height from ten to thirty inches, and in diameter from two to six feet, are so thickly scattered that where one ends another begins. The whole surface is studded with them, and resembles a lake blown upon by conflicting winds, and were it not for the diversity of their shapes and dimensions they would seem more the work of art than of nature. In the centre of each stands the trunk of a tree, which naturally forces on the mind the conviction that their origin is somehow or other connected with the circumstance. A very slight attention will probably enable us to explain the working of the causes which have produced them.

Every tree of the forest has sprung from a seed, not buried but thrown carelessly on the surface either by the tossing of the winds, or those innumerable other means which the Author of Life has adopted for the dissemination of the vegetable tribes. There it germinates and pushes its radicles into the ground. At first these creep on the top and dip down as they elongate, so that the fangs issuing from the stems are sometimes visible to the eye without removing any covering. The rain as it falls, after saturating the earth, meanders along the surface in such channels as it can find, and as present the least obstruction. But the trunks and roots oppose to its passage an insuperable barrier, and compel it to wind its way where the soil is loose and unentangled. This wearing down of the waters comes in time to deepen the space that lies equidistant from every two trunks, and of course to give the earth around them a prominent and raised appearance.

But this is not the popular history of their origin. There is another more consonant to the received opinions of the settlers who have passed their lives in the province and traversed its forests in every direction. And it is this: that all trees, at a certain period of their age, begin to decline, and are more easily overturned by the violent gales of winter. When they fall, the roots more immediately around the stem at its insertion into the ground, are first torn asunder and then elevated, lifting with them a considerable quantity of earth. Such objects are met with everywhere in our woods—the body of the tree lying prostrate, and the roots about the stem standing upright and holding a great mass of soil. But the action of the elements, they say, must in time dissolve the fibrous structure, and the earth will crumble

down and form the hillocks in question. That CRADLE HILLS have been formed in this manner can be readily admitted, but it is inconceivable that the trees of the forest which cover the whole of this country and of North America should have been blown down in succession, and with such regularity as to create those little mounds and the hollows betwixt them, which are so thickly set. Whatever may be the history or philosophic account of these tumuli is immaterial in the present discussion, because it affects not the arguments for levelling them, and on this part of the subject I beg leave to submit the following observations.

I. They militate against the correctness and expedition of all field operations. The plough cannot throw off a furrow of equal depth and breadth, when it is perpetually ascending and descending these hillocks; at one time plunging into the ground, and at another skimming the surface. The draught of the team must be irksome and fatiguing, and must vary with every inequality it encounters. The whole motions are not unlike those of a vessel in a storm, alternately rising and sinking with every heaving billow. It is impossible to train expert ploughmen on such fields, and the careless habits there engendered steal into the intervals and marshes, and prevent them from reaching the perfection of the art. Neither can the harrows perform their office aright, from the occurrence of such frequent interruptions. Here the tines are buried in the soil; there they touch it not. The highest tops only are pulverized, and the hollows derive no benefit from the operation. In fact, when we trace the influence of these cradle hills, from the first entrance of the share till the gathering in of the harvest, their efforts are uniformly pernicious, and strike us in new varieties of light. To the mower and to the reaper they are equally an incumbrance, and serve to embarass and perplex them in all their movements. It would be an abuse of illustration to dwell longer on these topics; and their existence therefore in so much of our cleared upland demonstrates the abject state of husbandry.

II. But the pernicious consequences resulting from them to the crops are not of less magnitude than to the rural operations. From the sowing in Spring till the full maturity in Autumn, they are a drawback on the success of the farmer. It is not possible, for instance, to scatter the seed with the same correctness as if the surface were brought to a level. The hollows will always receive more than their due share; and this first error propagates the mischief through the after stages of growth. The dews and rains which fall to refresh the earth will tend by their own gravity to the channels between the hills, and while the roots there are drenched with excessive moisture, those on the higher and neighbouring spots will be parched by unnatural drought. To add to the evil, if anything further is necessary on this head, the rising grain, when it shoots into ear, cannot be exposed equally to the kindly and genial influences of air and light, and consequently cannot advance with the same regular progression. In short, all the inconveniences attending high ridges, which have been reprobated in English

Agriculture and to which an end has now nearly been put, extend to our cradle hills; and the arguments against the one are applicable to the other with the same degree of force.

It is fruitless for us to expect the same returns from our soil as are given in well-cultivated countries till we take the like pains in all the preliminary processes. We must level the surface—plough with regularity—expose the crop fully and without distinction to the solar ray—incorporate with the mould a full proportion of calcareous earth—introduce a system of rotation—provide fitting and essential implements—and then we may confidently hope for the full requital of our labours. The laws of the material world are of impartial operation, and act without any regard to those petty distinctions by which men distribute their favours. Our scantier crops compared with those in England, after taking the difference of climate into account (and ours is indubitably superior), are to be solely ascribed to our unskilful and imperfect style of culture.

III. The evils arising from the cradle-hills are the more to be regretted because the remedy is neither laborious nor expensive. Although no indications of these primeval hillocks are now to be traced in the cultured plains of Europe, and although the plough has long before the present age obliterated these ancient memorials of the forest, there are inequalities of a different kind which require to be levelled by the application of machinery, and accordingly a plough for that purpose of a peculiar construction has been introduced into England. *It consists of a sole about three feet broad and about the same length, with the front turned up a little and shod with iron plates. To the sides of this are attached two handles, by which the plough, or as it is sometimes called, the levelling box, is held up and regulated. As the front is lined with iron that it may stand the friction and fatigue of penetrating the ground, the other three sides are fitted with short uprights, to which boards are fastened—that the earth forced into it in the line of traction might be prevented from falling either backwards or laterally. A chain is so adjusted to this machine as to balance the draught, and neither to press it forcibly into the ground, nor yet give it a disinclination to enter it. Such an instrument would scoop up the cradle-hills after they were loosened by the common plough and the harrows—and transport them to wherever the earth was wanted to fill up the cavities.

A more simple contrivance has sometimes been adopted that might be applied with the most beneficial effect. To the tail of the harrow a rake has been attached by means of two eyes working in a circular bar projecting above the hindment row of tines. To the rake are fixed two handles, to enable the operator to lift it occasionally from the ground, and disencumber it from the couch-grass and weeds which

*The Rev. Mr. Blackwood informs me that he is in possession of such a plough, which answers the purpose well, and effectually levels the cradle-hills. Any person passing Gay's River may inspect the instrument, and the reverend gentleman will be happy in giving the full details both of its construction and effectiveness.

it has collected. In place of the teeth of such a rake let us suppose a piece of cast metal substituted, seven inches deep, and the breadth of the harrow, and strengthened behind by stays reaching to the handles. It is manifest that as fast as the harrow broke and pulverized the cradle-hills, this close rake coming up would push the earth before it into the hollows, and thus smooth the whole surface. Should it meet with any resistance too powerful to be overcome, the workman, by lightening his pressure, would suffer it to slip over; and by again renewing that pressure, would operate on every hillock in succession during the whole length of his course. A turn or two of such an instrument on a fallow between the respective ploughings, when the mould is broken and friable, would do away with these unseemly inequalities which disgrace our Agriculture, encumber all the work of the field, prevent our cleared lands from drinking in equally the dews and freshening showers, and thus abstract materially from the quantity, fullness and perfection of our crops. It may be assumed as an undeniable position that an even and smooth surface is more easily wrought and much more productive; and that no other eminence should exist, save the formed ridges to carry off the superfluous water that would otherwise deluge the roots.

AGRICOLA.

Halifax, May 12, 1819.

West River, May 4th, 1819.

Mr. Young,

Secretary to the Provincial Agricultural Society.

Sir,—The honorary prizes assigned by our Farming Society for the furtherance of ploughing matches were contended for on a field belonging to me, on the 28th of April. As the youth belonging to this place cannot be expected yet to equal the plougmen from Britain, the candidates were divided into two classes, the first consisting of such as had learned the art before they came to this Province, and the second of such as were natives.

The judges—John Oliver, John Bonniman and Donald Fraser—adjudged the prizes as follows:

First Class.

First prize—to James Robertson, from Scotland, servant to Edward Mortimer, Esq. His team was a pair of oxen harnessed like horses and directed by reins.

Second do.—to William Campbell, from Scotland, servant to James Marshall, Esq., West River.

Third do.—to Thomas Belt, from England, servant to E. Mortimer, Both of these latter ploughed with horses.

Second Class.

First prize—To Robert Stewart, Jun., son to Mr. R. Stewart, West River.

Second do.—to Mr. W. Clark, farmer, West River.

Third do. —to David Ross, my eldest son.

The day was pleasant and the numerous spectators were highly gratified with the work, and particularly with the approximation of our own youth to those who came from Britain.

I remain, Sir, yours,

DUNCAN ROSS.

TRURO, May 9.

SIR,—I have to inform you that in our society three ploughing matches have lately taken place, one in each township, and these were appointed by the committee. The competitors were to be young men under thirty years of age, and natives of the Province. The first was in Truro, the 23rd ultimo, and attended by a great number of people. Six ploughs, drawn by horses, were engaged, and the performance was fully equal to anything that might be expected. The highest prize was allotted to Alexander, son of James Archibald, about nineteen years of age; the second to John Gevnay, twenty-one years old; and the third to James Talbot.

The next was in Onslow the week following, and was numerously attended and the work well performed. The highest prize was obtained by Mr. David Crow; the second by John Bishop, and the third by Richard Carter.

I have not yet heard how they succeeded at Londonderry. At the others I was present, and am happy to say that a spirit of emulation and good humour prevailed in all descriptions of persons assembled; and the novelty of the spectacle, added to its acknowledged usefulness, was a source of satisfaction.

I am, sir, most respectfully, your very obedient servant,

E. W. BLANCHARD,
Secretary.

To the Secretary of the Provincial Agricultural Society.

REMARKS.

Ploughing matches have been considered as among the first symptoms of improving Agriculture, and they have appeared in every country which wished to do honour and to excite notice to this important art. We only hear of them, however, when farmers are about the middle stage of improvement; for as correct ploughing is the prime and most essenial of all field operations, a degree of proficiency is soon acquired in it, and it then ceases to hold any rank in the scale of

competition. Accordingly, in Great Britain these matches have been discontinued, not from any decline in the ardour of pursuit, but because a wonderful degree of excellence has been attained by all the young men who turned their industry to farming.

As a very forward state of husbandry precludes and in a certain sense forbids the frequency of these exhibitions, so also an abject and lukewarm indifference about Agricultural affairs is unfriendly to them. Men who care nothing about the increase of our internal resources can find out a number of specious objections against all such assemblies. They can represent them as encouraging a taste for dissipation, as a waste of valuable time, and as a sacrifice to mere show and parade; yet they should recollect that at these matches some of the most generous and noble passions of our nature are called into play; that the effects of them are of a permanent nature, and will operate on the competitors when no eye sees them. The vanquished and emulous youth will practice in his own field, will there train his horses, will straighten and deepen his furrow, will study the character of the operation, will mark his own defects, and thus reach perfection from a principle of ambition. The victor, on the other hand, will strain at further excellence, because he knows that his skill will be put to a second proof on some future day of trial.

With heartfelt pleasure have I given these two letters to the public, the one from Pictou, the other from Truro; as marking a new era, and symptomatic of a new feeling. I am happy also to announce that the Cumberland Society is making preparation for three matches in different parts of the county—at Amherst, at River Philip and Remsheg. These are favourable specimens of enterprise in the eastern part of the Province; but what has become of the western? Some display of zeal on the part of the latter is necessary, were it only to convince us that they sympathize in the declared spirit of the country. I have looked with impatience to Windsor, to Horton, to Cornwallis, to Annapolis, and to Lunenburg; and I wish not to look in vain. There is vast room for improvement in all these counties as respects the skilful use of the plough, and much benefit will result from assembling their young men in a field of competition.

There is one painful circumstance in the matches this day recorded —the exclusion of British ploughmen from contending with our own. It is a public acknowledgment of inferiority; and I call on the sons of Acadia to wipe away the stain. They may at the present moment be behind the others in skill, but perseverance conquers all things; and a diligent and strict attention during the Summer to the working of their fallows will fit them for entering the lists on equal ground. This humiliating distinction must be blotted from the annals of our Agriculture; and our young men must not rest contented till they can strive, and that successfully, with the ploughmen of any country.

JOHN YOUNG, Secretary.

Halifax, May 12.

No. 35.

ON THE NATURAL OBSTRUCTIONS IN THE SOIL.

IT is a prevailing opinion among naturalists, that the mould which covers the exterior of our globe, and which is the seat and basis of vegetation, has derived its origin from the decomposition either of the primary or secondary rocks. Upon instituting a chemical examination into particular soils, they affect to find them compounded of the same original elements, and that too in the exact proportions, as are the strata on which they lie incumbent; and this circumstance not only strengthens the belief, but seems to place it beyond the reach of doubt or uncertainty. They have even attempted to point out the agents, whose all-subduing and irresistible power continually acting since the birth of creation, has wrought this mighty effect: and although the life of man, or even the age of history is too short to mark the successive steps of this process, the reasoning on that account is not to be esteemed the less conclusive, nor the inference more liable to dispute.

It may be necessary for the satisfaction of my readers to give a specimen of the manner in which the subject is treated: and for that end, I shall single out the modern lectures of a philosopher, than whom none has reached a loftier pinnacle of fame. Sir H. Davy, from his fortunate and amazing discoveries in analyzing bodies regarded before his time as simple and elementary, and from his happy application of science to the arts, stands in the very foremost rank: and his sentiments, in his own line of research, deserve to be listened to with attention and received with the utmost deference.

It is easy, he says, to explain the process by which the *disintegration of rocks is accomplished as preparatory to the formation of soil. If we take, for instance, soft or porcelain granite, we shall detect in it three distinct ingredients—quartz, feldspar and mica—names in mineralogy given to substances possessed of peculiar and distinctive characters. The first of these is a pure silicious earth, of a white and sparkling brightness, and usually found united into a chrystalline mass. Feldspar and mica are both of them mixed bodies; and are composed of silica, clay, and oxide of iron; the former in addition containing usually lime and potash—the latter, lime and magnesia. If granite, which holds the first order among the primary rocks, and is allowed to be the foundation on which our earth is constructed, be made up of such varied and heterogeneous materials, it is not difficult to account for its dissolution; and we need not wonder that its parts enter into new combinations, constitute the ingredients of the secondary strata, and are intermixed with all soils. When this rock protrudes on the service, and presents an unprotected and naked bosom to the elements, the lime and potash in the feldspar, and the lime and

*Sir H. Davy's 4th Lecture on Agricultural Chemistry, page 189.

magnesia in the mica, speedily imbibe from the atmosphere a portion of carbonic acid, while the oxide of iron tends to unite with more oxygene. The rain too is perpetually supplying moisture which serves to break the cohesion of their structure, and prepare them for more rapid disunion. The three constituent substances however are not alike prone to submit to the actions of these solvents; and accordingly, they fall to pieces at different periods of time, and obey laws which act with more or less force in particular circumstances. The feldspar, which is the cement of the rock, first yields and forms clay; the mica next gives way and mixes with the other in the shape of sand; and the quartz which remains longer undecomposed, appears sometimes as gravel of different degrees of firmness, and sometimes as stones of all shapes and sizes. The disintegration of these granite rocks becomes by this means the base of a crumbled and friable soil, which owes its formation to the efficacy of those powerful agents—water and air—which are distributed everywhere for the wisest and most beneficial ends. So soon as the first layer of earth is but imperfectly broken down, lichens, mosses and other plants of the same class, which are constantly floating in the atmosphere, take root and grow; their death and decay give a beginning to organizable matter, and enrich the quality of the soil. The grasses and more perfect plants succeed, absorb nourishment from the free and unformed elements of nature, perish in their turn, and blend their remains with the earth which upheld them. The rocks all the while continue to be acted on, are further decomposed, and are either incrusted or mixed with a larger portion of putrescible matter, till at last arise the trees—the lords of the vegetable world—and take firm and undisputed possession. Every autumn they strew their leaves, and add a thin layer of decayed matter to the soil. This double process of decomposition below and of growth above, has advanced with a regular and uninterrupted progression since the beginning of time: and the exterior of our globe has thus become what we now behold it.

This ingenious theory gives a satisfactory and luminous solution of the differences of vegetable mould, which are met with in every country and region. If it be true, that the soil has arisen from the rocky strata, it is but natural to expect a very considerable, nay endless variety. There are no less than eight primary, and twelve secondary rocks, to say nothing of the numberless ways in which they are compounded together, which have been noted by geologists. These are not disposed in level and unbroken strata, but rise either in vertical columns, or lie in beds more or less inclined to the horizon. It is this irregularity of their incumbency, which brings them all to the surface in succession, and enables the diligent observer to mark the order in which they are grouped. Although grauwacke be the lowest of the secondary rocks, and may be succeeded either by limestone or sandstone, and these again by coal and shale; yet in consequence of this almost universal obliquity in the angle of their inclination, the grauwacke in the end ascends, and becomes visible at the surface. Hence

geological maps have been constructed of all the counties in England, which exhibit at one view, and by means of shaded colors, the arrangement of the internal stratification; and pourtrays the place where each bed comes to the top, and forms the basis of the soil.

Few or none either of the primary or secondary rocks can be said to be pure and unmixed. The Author of Creation in the structure and conformation of dead and inert matter has indulged nearly as much in variety, as he has done in the organized and animated forms of existence. Sand, clay, lime, magnesia, the vegetable and mineral alkalies, with various metals, are compounded into an infinite diversity of admixtures; and enter, more or less, into the constituent principles of all rocks. Granite, Schistus, Sienite, Hornblende, Porphyry, Quartz, Mica, Basalt, Gypsum, and many others with like uncouth names which the German language has introduced into this science, are neither more nor less than the simple and original earths, formerly described in these letters as the ingredients of soil, in new and complex states of arrangement with acids, alkalies and metals.

These various rocks, when exposed to air, light and water, dissolve not all with the same facility. Some are speedily reduced, while others seem to resist the change with the most inflexible obstinacy. This further principle of their cohesion accounts for the present appearance of the earth. Wherever the strata on the surface were composed of soft and yielding materials, there now exists a deep and loamy soil; where of hard and impenetrable substances, a thin and hungry one scarcely concealing the original rock; and where of mixed matter, partly hard and partly soft, the soil is now found obstructed with stones. According to this view, these were either embedded in the rocky stratum or formed a part of it, and have withstood the continued action of the great dissolvents in nature, while all around them, in the lapse of past ages, have mouldered and decayed.

Were we disposed to enter further into this subject, a theory might be constructed so simple and explanatory of all the facts as powerfully to lay hold of the fancy at least, if not of the understanding. The great impediment in the way of yielding a full assent is the assumption of the principle which rests at the basis of the theory, and which is that the dry land in the northern hemisphere, including as well America as Europe and Asia, was at a remote age drowned, for a great length of time, by the waters of the ocean, and that the summits of the loftiest mountains were covered. The beds of shells which are found at different elevations—the variegated marbles and porous limestones which have been formed out of these beds—the fossil remains of animals which lie buried at different depths, and under regularly arranged strata, which must owe their origin to the action of water, are geological proofs, that the sea at one time has occasioned some mighty catastrophe on that portion of the globe which is now most densely peopled. We must take also for granted that these waters retreated, either into some central cavity prepared for their reception, or towards the South Pole, to overwhelm the Terra Australis, so long

the search of navigators, and the existence of which has been preserved in Oriental tradition, and thus left the bed or bottom dry; and with these postulates we can account for the formation of the present soils with which our continents are diversified. When they rose from the deep, all the high lands would present the appearance of naked rocks which had been washed bare by the motion of the waters; and the hollows and basins would contain successive layers of loose matter lying above each other horizontally, or at angles more or less oblique, according to the inclination of the substratum on which they were placed. The valleys of this new earth would present the first bed to vegetable life, while the rocks which towered around and above them would begin to disintegrate. But the separation of the parts would go on at very different rates of progression. A lime rock or chalk hill would decompose much faster under the attrition of the elements than an indurated schistus or silicious sandstone, and these latter would wear down very variously according to the force of their cohesion or the nature of their ingredients. Plants would quickly seize the newly formed soils on the rocks and be effected in their growth by the physical circumstances by which they were surrounded. Vegetable mould would now begin to increase and multiply apace, as all the agents were at work by which it was generated. The remains of plants and of animals added to the dissolution of the strata would, how slowly soever, tend to thicken the soil, and its richness would be compounded of the original fertility of the mineral materials and of their relative exposure and elevation. If a well-constituted stratum had been heaved to some eminent point, or depressed into a hollow, vegetation would be chilled by an ungenial coldness in the one case, and checked by an over-abundant wetness in the other. On the summit, little vegetation matter would be formed, and the soil could only proceed by the decomposition of the rock; in the hollow, aquatic plants would take root and by their alternate growth and decay create a peaty fen or morass. From these agencies, variously combined and modified, all the diversities of soil which we now behold could originate. The hard and durable rock would take centuries, or perhaps millennia of years, before it began to break down sufficiently for the roots of plants, and there we now find a thin and hungry surface; a softer one and composed of a due mixture of the earths which conduce to fruitfulness, might disintegrate soon after the present figuration of our globe, and thus at once afford a soil which has been gradually improving under the organizable matter which it has been supporting. A blowing sand may have continued to the present hour a barren desert, because unpropitious to vegetable life; and the primeval granite, which hides its head among the clouds, may be so much elevated as still to bare its uncovered brow within the circle of perpetual congelation.

Without stopping to enquire into the soundness of this hypothesis, or to weigh the many arguments which may be supposed, at first sight, to invalidate or confirm its conclusions, I shall go on to remark that of all the natural obstructions in the soil, which oppose the execution of

rural labour, and which must be removed by human exertion, rocks are the most troublesome and expensive. Happily for this Province, it is, for the most part, free from this incumbrance. After clearing away the forest and rooting out the stumps, the plough meets with no farther interruption, and can proceed without danger in turning over the furrow for the reception of the seed. In truth, were our uplands in the interior much infested with these obstacles, the progress of our Agriculture would be completely arrested, and no man would be warranted, in the present circumstances of the colony, to attempt improvement and invest capital in such hazardous and doubtful speculations. Our surface, in many districts, has been so much broken down and subdued by the dissolving energies of nature that there is not a trace of rock to be met with, and even some inconvenience is felt for the want of materials to serve as the foundation of our wooden buildings. In the present state of our population and with our existing means of improvement, we would be compelled to abandon Agriculture and seek subsistence from the ocean, did the interior present the same stony superficies as everywhere compasses the capital and lines our Southern Coast. The expense necessary for clearing land in the peninsula of Halifax would be most injudiciously and ruinously laid out at any distance from the market; and the local situation alone justifies the vigorous exertions which have lately been made to improve the five acre lots, and extend cultivation around the town. Every additional acre which is brought under the plough carries with it an accession of comfort to the inhabitants, not only in an increased supply of the produce of the dairy, but of the vegetables which are wanted for the table.

In the same point of view the letting of the Common in long leases by our magistrates is a measure of enlightened policy, and although a partial disadvantage may be sustained by certain individuals, who suffered their cows to graze there during Summer, the public must be gainers by the transaction. These small patches of land in the vicinity of a large town afford amusement and exercise to the citizens, and when so moderate in rent and so numerous as to come within the reach of the mechanic and labouring classes, they give an innocent and useful employment to those leisure hours which every man possesses, after the more serious and toilsome business of the day is over. Commons are now discovered to be the most unproductive kinds of land, and are universally reprobated by all who can form a just estimate on the subject. It is the interest of no man to spend capital in their amelioration, and the withered and scanty herbage which clothes their surface is the spontaneous effort of vegetation unaided by manure or industry. The aspect of ours, compared with the smiling verdure of the neighbouring fields, is a confirmation of whatever has or can be said against them. The small part which was last year enclosed and cultivated as gardens yielded more value in produce and was more beneficial in supplying the vegetable market than all that remained in its original state of rudeness; and the obvious advantage of this first

trial should, one may think, encourage and extend the letting of the whole, as far as is consistent with certain reservations for public uses.

The same plan of working and improving stony soils has not been adopted in all places; and perhaps it might throw light on our practice to become acquainted with what has been done elsewhere, with respect to the manner of removing these cumbrous obstructions, and of using them in the erection of permanent fences. There is no part of the old country where this style of improvement has been more general than in *Aberdeenshire, and none where, from the introduction of manufactures, the increase of population and the influx of wealth, it had become more urgent and desirable. In the year 1764 there were little more than 500 acres within three miles of Aberdeen which were either arable or could be cultivated with the plough, and the town was encircled by a barren zone of rough and broken ground, covered with heath and large masses of granite. Milk and garden vegetables were in great demand, and grass land, both for hay and soiling, rose to a rent first of four and five pounds, afterwards to twelve and in some cases to fourteen pounds per Scotch acre. At this time an accidental but fortunate event took place, which created a demand for the stones lying on the surface. The streets of London required to be extended and paved, and Aberdeen granite was preferred as the most durable material. Hence a merchant, who had purchased barren land for a villa, and set about reclaiming it more for amusement than the expectation of gain, found that, by the sale of the stones, he was repaid half of his expense, even although he laid out forty or fifty pounds and in some cases one hundred pounds in the trenching, manuring and improving a single acre. The exertions of this spirited individual awoke the neighbourhood to the benefits of the system, and about three thousand acres were trenched within a circle of three miles described around the town. The operators gained a more perfect knowledge of this art from such extensive practice, and they carried it into the inferior districts of the county, so that not less than twenty thousand acres in all, formerly useless for Agricultural purposes, have been added to the arable land of Aberdeenshire. †Their mode of proceeding in this: A trench about fourteen inches deep, three feet wide and of whatever length may be thought necessary, is first thrown out and laid on the barren surface—the stones being carefully picked out and placed aside, till they can be conveniently carried off. The bottom of the trench is then shovelled out either in a plain or sloping level, according to the direction of the ground. The labourer proceeds to mark off other three feet in breadth, to take off with his spade the first spit, generally about eight inches deep, and to lay it with the surface inverted, in the last trench. He then steps into the hollow and throws up the loose earth till he reaches the depth of fourteen inches. If the subsoil be too hard to be penetrated by the shovel or spade, he applies

*Dr. George Skene Keith's Report of Aberdeenshire.

†General Report of Scotland, vol. 2d, page 397.

a mattock; if stones of considerable bulk occur he uses an iron crow or a wooden lever of oak or ash pointed with iron; and should all these fail, he has recourse to repeated blasts of gunpowder, by which the larger masses are reduced to a size fit to be transported in a cart. Proceeding backwards, he lines off other three feet, and performs over again the same operations; and by these means the land is completely trenched deeper than the plough can reach; and the inverted surface in the bottom becomes an artificial channel, between which and the hard subsoil the water may flow, without rising to the surface and injuring the crop. The expense of this process on barren land exceeds £20 per English acre, but the improvement is so effectual and complete that proprietors consider themselves as indemnified, in escaping afterwards all mischances to the working implements, and in possessing a soil thoroughly calculated for the most perfect cultivation.

This practice of trenching has extended over all the northern districts of Scotland, wherever stony lands abound; has found its way into the Counties of Perth, Forfar and Inverness, and even travelled southward into Berwickshire. It is preferable to our mode of picking the ground with a mattock on the Peninsula of Halifax, and removing the surface stones, because many of these lying at the depth of a few inches escape observation, and afterwards interrupt or embarrass the movements of the plough. Were it not for the difference of expense, there is no comparison between a thin mold of five or six inches and one trenched and entirely cleared of every obstruction to fourteen inches deep. The latter soils are admirably fitted to produce taprooted as well as corn plants, and red clover in particular thrive well on them.

There is a cheaper mode, called trench-ploughing, which has been resorted to in particular soils. A team of four and sometimes six oxen, yoked to a strong plough, are set in motion and carry before them every ordinary obstruction. The stones which impede their passage are displaced and thrown upon the surface, and when the operation is conducted with skill, much work may be accomplished without accident and in a short time. The depth of the furrow ought not to be less than eleven or twelve inches, and if this, from the hardness of the ground, cannot be effected by one plough, a second may follow in the track of the first and will more easily descend. This operation, however, is only practicable in a loose and friable mould, for if the subsoil be stiff and tenacious, no force can be effectual, short of the mattock and the spade. The nature of the soil will at all times direct the skilful improver in that process, which is suggested by the dictates of necessity or convenience.

The stones and rocks are incontestibly best disposed of in the construction of fences, and the application of them this way on the peninsula here, when they cannot be sold for building or ballast, is both judicious and useful. The thickness of the wall should be proportionate to the quantity of stones which are to be removed, but the height of it should never exceed four feet and a half, because that is sufficient to confine any sort of live stock, and a greater altitude would

only endanger the durability of the structure—in itself abundantly frail and tottering. An additional thickness, to consume the stones, is infinitely better than piling them up in unsightly heaps in the centre of the field—there to remain as monuments not only of our bad taste, but of wretched and careless husbandry.

The grand objection to all our stone fences is the want of a coping; and it is singular that this defect prevails universally and seems to offend no eye. Nothing looks so naked and unfinished to a person who has been accustomed to the neat, regular and often tasteful copings which are met with at home. A wall left like ours is unknown either in England or Scotland, and, for my part, I cannot conceive whence this practice was borrowed, which operates against the stability of the fence and exposes it to a multitude of accidents. It was within the last twenty years a custom in Britain to cover such walls, after they were carried up to the usual height, with turf or sod pared off a common, wherever the grass-roots were found most closely matted together. These, to the thickness of from six to nine inches, were laid on the top of the fence edgewise, and beaten down with the back of the spade. From the humidity of the climate, they often preserved a verdure even in the heat of Summer; and although in the course of time they always decayed and moulded into earth, they generally lasted for several years. But of late a more permanent and useful coping has been introduced, which not only gives a finish to the work, but adds much to its strength and solidity. This is to lay along the top a range of large rough stones, set on edge and firmly bound together, by driving in with a hammer thin pieces between them. The coping, by this means, is so firmly impacted that it is impossible, without a considerable exertion of force, to displace any of these wedged stones, and they are thus secure from being overturned by the straying and careless foot of the trespasser. They hang on each other like an arch, and press not on any weak or ill-built part with their full weight. The adoption of this plan on the peninsula, although at first a little more expensive, would in the end be a saving, and our walls would continue good and effectual for a much longer period, and would be less apt to fall into breaches. During the course of the building, all the stones might be selected and laid aside which are fitted from their shape and length for the purpose, and the wall when completed would have a finished, durable and compact appearance.

AGRICOLA.

Halifax, May 20, 1819.

TO CORRESPONDENTS.

This week I have several letters, but they fall short of the number to which I have been long accustomed. My old acquaintance seem to think that the whole burden of keeping up the interest of my weekly essays has been devolved upon the secretaries of the different societies;

and that they now may remain inactive and idle spectators of the drama, and allow me to perform my part, and to figure on the stage without assistance. It should be recollected, that the communication with the several associations is rather official than literary; and that I am seldom written to but on business. The varied and important intelligence, partly practical and partly scientific, which before poured in from all quarters of the Province, has ceased to flow with the same full and constant tenor: and my letters, no longer supplied from these tributary streams, must necessarily contain a less body of information. I am not equal to the task without public support; and therefore I claim as of right all local and particular details, illustrative of the subject I am handling at the time. Upon the obstructions in the soil preventive of tillage, I have not received one word of intelligence, except so far as regards the cutting down of the forest; and on that account, I cannot confirm and justify my reasoning by reference to facts. I flatter myself, that after this public call I shall again be honoured and assisted by a general correspondence.

AGRICOLA.

DIGBY, May 7th, 1819.

TO AGRICOLA:

Sir,—I take the liberty of inclosing you an account of the establishment of an Agricultural Society in this place, so far back as the 16th January last, which ought to have been communicated to you before this period.

The principal reason of this delay was, that a gentleman, who had been chosen to an office, was not in the county at that time; and it was deemed necessary to wait his return, or answer to the letter sent him on his appointment.

I had also written the different committees, by order of the society, for information on the two following subjects, viz:

I. Does your district produce sufficient bread corn for its own consumption? If not, what proportion does the deficiency bear on an average of three years? And what are the causes thereof?

II. What is your mode of cultivation, with any other information on the subject of agriculture you may think proper to communicate? And what are the prevailing soils in your uplands, &c.?

I have been looking anxiously for answers from the different committees for some time past; but as yet have received none, with the exception of a letter from the vice-president, and one from Mr. Wm. Johnston an intelligent farmer residing in this township. After acknowledging in polite terms, the receipt of my letter, the vice-president says—"I have just time to write a few words. (He was setting off on a journey.) Indeed I see with pleasure the spirit of the country in following up the views of Agricola; and I am sincerely

disposed to promote that spirit amongst the French people, and will give any information in my power for the purpose." Mr. Johnston says—"The soil in general on this peninsula is a good loam, with a mixture of gravel in some parts; in others, of large stones which obstruct the plough. Our method of tillage generally is one green, then one white crop, when we sow grass-seed both on new and old land, which holds in grass tolerably good from five to seven years; when again it becomes necessary to break it up for a green crop. It appears from the best information I can procure that not more than one third of the corn consumed on the peninsula is raised upon it, which I conceive is unquestionably owing to bad management; as I have, for twenty years last past, sold bread corn from my farm to double the amount of whatever I have bought for the support of a large family in other articles. At present, I am much interrupted in raising white crops on old land, from its being almost overgrown with the weed we call the nettle; and wish for fnformation how to extirpate it."

"Our method of preserving turnips is in heaps of about thirty bushels each, covered thinly with fir bushes or twigs; over that about four inches of earth; and they may be taken out for use at any time in the winter—I have delivered five hundred bushels in April kept in this way, without the loss of a turnip."

Mr. Johnston further informed me that he had derived much useful information from your publications, of which he would avail himself. I wish you would inform him through the medium of the society, how to get rid of this noxious weed he complains of. Agricola will observe, from what I have here stated, that I am not yet enabled to reply to his circular of October last, which would have given me much pleasure.

I regret this communication had not been made at an earlier period, as we are thereby precluded from reaping the same advantages this season as the other societies.

It is not yet forty years since this township, the lower district of Clements and the township of Clare, were in a wilderness state with very little exception. The settlers had many and severe difficulties to encounter which they have happily surmounted, and are now beginning to taste the fruits of their labour; our state of cultivation is of course much behind the eastern part of the county, which comprehends the oldest settlements in the Province. Seed grain of all kinds is much wanted here; those we have are mostly run out—oats in particular, which do not weigh in general more than 28 lbs. per bushel, and some not so much. There are two causes which produce this effect—lateness in sowing, and poor seed. I have been credibly informed that oats grown here on new land, from seed brought from the south of Scotland about thirty years ago, weighed fifty pounds per bushel; I have seen some that weighed 40 lbs. from whence it appears that neither soil nor climate are in fault. Our breed of cattle and sheep are also in want of improvement.

Many of our farmers, particularly in Clare, laugh at the idea of being taught, so much are they wedded to old habits ; however, I trust these will be convinced ere long, by the example and advice of their worthy pastor, that they have yet something to learn. When brought to this point, I am satisfied it will highly promotetheir true interests.

I am with much respect, your most obedient servant,

WILLIAM MUIR, Secretary.

A meeting of the inhabitants of the western district of the county of Annapolis, was held at the Sessions House in the town of Digby, on Saturday, the 16th January, when a society entitled the Digby Agricultural Society was established, and the following officers elected, viz :

President—Reverend Roger Veits.
Vice-President—Reverend John M. Segogne.
Secretary—Mr. William Muir.
Treasurer—Mr. David Rutherford.

COMMITTEES.

Town of Digby and its vicinity—Elkanah Morton, Esq., Mr. John F. Hughes, Mr. James Reid.

Digby Neck or Peninsula—John Morehouse, Esq., Mr. Wm. Johnston, Mr. Wm. Sanders, Mr. Ezra Hammond.

St. Mary's Bay and Sissabou—Cereno U. Jones, Esq., Capt. John Cossman, Mr. Ambrose Haight.

Township of Clare—Charles McCarthy, Esq., Samuel Campbell, Esq., Lt. Col. Saml. Dousett, Capt. Samuel White.

Lower District of Clements—Capt. Edward Dunn, Capt. Henry Oaks, Mr. John Tulis.

The meeting was numerous and respectable.

WILLIAM MUIR,
Secretary.

Digby, 7th May, 1819.

REMARKS.

This letter from Digby, announcing the establishment of an agricultural society as far back as the 16th January last, and of which no previous intelligence had been conveyed, affected me with a good deal of surprize ; and I have no doubt, will so affect the public. This concealment has been unfortunate in a double light ; inasmuch as it has unnecessarily delayed the opening of a correspondence with the Provincial Board ; and has shut out its own members from participating in the full benefits of the legislative grant. A share too of the potato oat seeds, which weighed from 42 to 43 lbs. per bushel, and which have

been distributed among the societies known to exist, might have restored, in some measure, the quality of that useful grain in the western districts of Annapolis.

In every other point of view the communication is satisfactory; and atones for its late appearance by the richness and variety of its information. The general style of culture there is the same which prevails universally throughout the province:—a green crop of potatoes or now and then of turnips, followed by a white one; and both concluded by a long interval of grass and pasture. This system accounts for the deficiency of corn in reference to the consumption; and for the predominance of weeds in old land. Every field fit for cultivation, is not appropriated more than once in every 8 or 9 years for raising grain, of which, too, part is oats that are never ground into meal for domestic use, and are moreover so much degenerated as to be totally unworthy of reproduction. From these various views it may be justly estimated, that not above one in every twelve arable acres is destined yearly for bread corn; and that the districts contentedly submit to purchase their bread from the States, rather then exert themselves to enliven and invigorate their own husbandry. Perhaps, too, they believe that our climate and soil are hostile and unpropitious; and that nature, not igorance, has cursed us with poverty. At all events it is plain that the French population in particular are too wise to be taught; and that they have carried the system of agriculture to such an exalted and enviable pitch, that they would laugh to scorn any officious instructor who should presume to question their management, or dare to prescribe rules of improvement. From such a hopeful generation much may be expected; more especially as they have carried the matter so far already, as to raise a third of their own bread, and advance the weight of oats to 28 lbs. per bushel. These facts ought to sound in their ears like the thunders of a wrathful Providence, and are infallible indications that they have violated the laws of God and Nature. In the bleak and barren Peninsula of Halifax, oats this last season were raised weighing 44 lbs., and if the present spirit which animates our farmers falls not asleep, all the wretched and miserable trash of light oats shall be swept from the Province, and potato, Angus and Friesland, substituted in their room. Next to wheat, oats hold a second rank in the scale of bread corn, and they will be found the best and surest friend of Nova Scotia in her present circumstances, unless we are disposed to condemn the blessing and perpetuate our own degradation.

Mr. Johnston, who in that neighbourhood is accounted a most skilful and industrious farmer, asks of Agricola information with regard to the best mode of extirpating the nettle, with which his old lands are overrun. As the evil of which he complains is not confined to his farm, but spreads over a large portion of our arable land, I shall give him a public in place of a private answer. It is told of Demosthenes, who carried ancient eloquence to its utmost height, and himself attained such unrivalled excellence as to have eclipsed not only his own con-

temporaries but all succeeding imitators, that being one day asked, what was the chief glory and merit of an orator? He replied, action; what was the second? action; what was the third? action; and so invariable was his answer on every repetition of the question, that no doubt seemed to remain on his mind, but that this qualification comprehended and embraced all others! In the same temper I am disposed to answer the interrogatories of Mr. Johnston and the Secretary: What is the most effectual plan of clearing land overgrown with weeds of every description? summer-fallow; what the most necessary preparation for raising bread corn? summer-fallow; what the best means of improving our Agriculture and curing the various distempers under which it labours? summer-fallow. In fact, this operation of summer-fallow is imperiously called for in all the old arable inclosures, whatever may be the nature of their soil, or whatever the course of management under which they have been hitherto treated. These have been either so much impoverished or are so much infested with weeds that they are laid down to grass from necessity, and their owners are fearful to open them anew, least their hopes of a crop be defeated by the multitude, strength and rapid growth of these formidable enemies. Hence, man, who is constituted the sovereign of the soil, is forced to abandon his own possessions and leave them for the maintainance of the lower and domestic animals; and for himself and the supply of his own wants, he must hew down the forest and there seek that wheat which his skill cannot produce from the fields, that have been cleared by his own or the industry of his forefathers. The introduction of summer-fallow will apply a remedy to these multiplied disorders. It will afford the means of perfecting our youth in the art of ploughing; it is the best preparative for Winter and Spring wheat, and by it alone can our weeds, of endless names and characters, be effectually eradicated.

AGRICOLA.

Halifax, May 21, 1819.

No. 36.

ON THE NATURAL OBSTRUCTIONS IN THE SOIL.

AFTER the forest had been cut down and extirpated, the inequalities levelled, and the stones and rocks removed, there occurs in many situations another obstacle of no ordinary difficulty, which must be surmounted by human labour and skill, before the farmer can reap the full and anticipated fruits of his industry. Springs issue from the face of the hills, and in descending towards the valleys spread over a great space; and thus they both sour the temper and spoil the fertility of the soil. The waters collect in the hollows, and cover entirely the original earth; aquatic plants, which in a great measure are useless to man and the animals he has domesticated for his use and pleasure, take place of natural and artificial grasses; pestilential exhalations arise; creeping things of strange and hideous aspect, of impure and poisonous nature, quicken into life; and in process of time, a morass, such as is found in every uncultivated country, is regularly formed, Hence a new class of obstructions demand our attention, which are no less preventive of rural operations and of the plough, than the more formidable hindrances of forest trees, stones and rocks. Wetness in any soil is destructive of healthy and vigorous vegetation; and no pains taken to remove it can be considered as ill bestowed; when successful, they are repaid with an adequate and liberal recompense.

Before, however, suggesting any remedy, it may be proper to trace the source of the evil; to mark some specialities in the stratification of our globe; and cast some light on those hidden and internal reservoirs lodged in the bowels of the earth, and from whence originates much of that mischief which it is the business of the enterprising and skilful agriculturist to prevent.

The internal structure of the earth is not a heap of materials jumbled and thrown loosely together, but an arrangement of a certain order, and according to definite laws. The presiding principle in this region which is buried from the sight of man, and where his power can only be partially acknowledged, may be described as a regular distribution of parts. Successive layers lean on each other either in solid or less compact masses; and these lie at every possible angle of inclination, from the perpendicular basaltic column to the horizontal sandstone-rock. Some, both of the primary and secondary formations are broken into fissures, through which decends to a lower level whatever fluid may be circulating through the interstices of the earth; and others are so compact as to exclude all entrance of moisture. This observation applies with equal justness to the looser as to the more solid strata. Many of those are of a porous nature through which the rains and dews, that drop from the clouds, quickly percolate and sink downwards; while others are impervious and resist all admission of water. Thus: sand, gravel, and loam suffer moisture to pass through them easily; but

clay and certain earths which have a proportion of adhesive matter in their composition, are of so close and retentive a texture as to be totally impenetrable. It is this diversity in the structure of strata, from which springs take their rise; and a knowledge of the former combined with a minute and careful attention to their order, must precede every rational system of draining. Quarries, mines, caverns, wells which pierce into the interior of the earth, are the chief means by which this information can be obtained; and an accurate inspection of these wonderfully helps to advance the views of the scientific improver. In defect of such aid, an examination of the beds on the sides of the adjacent mountains will throw considerable light on the internal disposition of the valleys; and although the structure in two places be seldom so unvaried and uniform as to justify confident and bold conclusions, yet a remarkable coincidence often prevails and leads, in many cases, to certainty and truth.

From these general explanations, it is easy to see whence springs and wetness originate. The showers which fall from the heavens sink into the ground till they meet with an obstructing layer capable of retaining them. If it be a bed of clay, they run along its surface, fill and occupy all the hollows and form subterraneous reservoirs; if an impervious rock without any chinks through which they can descend farther, there they collect and accumulate; and as water in every possible situation preserves its level, they search for an outlet in the upper edge of the stratum which contains them. Should this outlet prove a gap of moderate dimensions, it forms a fountain that flows with more or less permanence and regularity, in proportion to the volume of the confined fluid whence it issues. But if there be no such breach in the rock or bed, the reservoir continues to swell and rise till it overflows the whole lower ledge; and in place of a perennial spring which gladdens the sight and refreshes the animal creation, we have a piece of wet, spongy ground, which destroys the tender and kindly grasses, and is unfavourable to all growth. Wherever such appearances strike the eye on any declivity, it is an indubitable sign that the places through which the water is oozing are the termination either of an impervious rock or of an argillacious bed which has stretched from the interior of the mountain to this visible outlet. No doubt can rest on this conclusion, although drawn in the dark, for it is as uncontrovertible and certain as a mathematical theorem. Water in the interior of the earth must be subject to the same laws as on the surface. The principle of gravitation would carry it downwards at right angles to the horizon through all the intervening strata were it not diverted from this perpendicular course by the interposition of some unbroken and tenacious surface, which gives a different direction. Whatever that surface may be, it will meander along it and follow the lowest level till it encounters some opposing obstacle when it will form a pool or reservoir, the volume of which will accumulate to the top of the obstruction and begin again to flow. They are the impervious beds which stretch parallel to the horizon, or nearly so, that bring out

the internal waters to the sides of the declivities, and there form either springs or occasion wetness.

These views, which illustrate the descent and disposal of subterraneous water in hills and other eminences, fail when the attempt to apply them to valleys and levels, and a new set of principles come into action, to regulate the conduct of the agriculturist. These also must be explained and studied before he can venture on any extended plan of draining with the least hope of success. If he proceed to this first and fundamental step in improvement without a competent knowledge of first principles, he is sure to blunder, and most likely will lay out his capital without accomplishing the object. Sensible I am that most men never dream of enlisting science in the service of Agriculture, even in her most important and sublime operations—such as the creative processes of germination, the shooting of the air, the evolving of the flower, and the final production of the seed—far less in her mean and ignoble labours; and they would deem philosophy fallen and degraded to the lowest pitch of abasement, should she condescend to toil with the workman is cutting open and covered drains or in conducting them skilfully; and yet true it is, that unless she stand by and direct this manual drudgery, it will be often fruitless and unavailing.

The rains and dews, the snow and hail, which descend on every tract of country, are disposed of in two ways, and only two, for although evaporation is continually going on at the expense of all aqueous fluids, and may in one point of view be considered as a contrivance of nature to get rid of superfluous humidity; yet as far as draining is concerned, it ought not to be taken into account, nor in the smallest degree to influence our reasonings.

The first of these ways is the trickling of innumerable but small rills along the multiplied channels on the face of the ground, till they fall in with the next stream or rivulet, which is created or increased by their junction. The latter thus augmented winds along the valleys and carries its waters to swell the deep and majestic river that at length loses itself in the ocean. This may be called the *surface discharge* of moisture, because it never penetrates the ground, but proceeds with a slow or quickened pace to the termination of its course. During the whole passage it is useless in an agricultural view, because not drunk in by the earth to replenish the waste of vegetation, and it is often destructive by investing the mountain torrent with resistless fury, to sweep before it the promised fruits of the harvest.

There is another method of disposing of the superabundant moisture; and this the Author of Nature has converted to the most beneficial of purposes, and to it principally the skill of man must be directed in the various operations of draining. The falling rains are freely imbibed by the parched and thirsty ground, and after saturating the vegetable mould, they disappear and find their way into every interstice, fissure and canny. As chance may direct, they burst out at the foot or sides of the mountain into springs of living water, or they issue at many pores, to the annoyance of the farmer; but the great

body of them lodge in the recesses of the earth, and never rise to the surface. By secret and unknown channels they travel and descend through the openings of the strata, till they arrive at the ocean—the great receptacle of all terrestial fluids—mingle and are lost in its vastness, and again perform the circuit of evaporation and descent. These internal reservoirs the scientific drainer labours to reach, in order to tap them, because from thence proceed chiefly the evils he is solicitous to obviate. For the sake of illustration, let us suppose a valley encircled by hills except in one quarter, where exists an outlet by which is discharged the brook collected in its centre. Let us further suppose that a close, tenacious bed of clay at a given depth, stretches across the valley and up the mountains from summit to summit, and that above it reclines a stratum of gravel, through which water can diffuse itself with the utmost facility. Over this loose gravel another coat of clay is spread, which rises, not as in the former case, to the tops of the hills, but breaks off midway in the ascent. Above the whole rests the vegetable mould, which has been formed by the washing of the rains and the accumulation of putrescent matter from the decay of plants. This description which I have drawn is not borrowed from the fancy, but is a faithful picture of existing situations in every extensive region. The surface of this supposed valley, in the first place, will give rise to some brook or rivulet and be nearly a continued swamp, where the mossy tribes vegetate and multiply vigorously. By clearing and deepening the channel of the brook, the water will be partly drawn off, and by various drains cut in all directions something like a remedy may be effected. Still the great source of the evil has not been approached, for an immense body of water has gathered between the two coats of clay, and from the pressure behind is perpetually endeavoring to break through the upper stratum. This naturally will be soft and miry, and through it a sufficient quantity will ooze, notwithstanding its impermeable nature, to keep the surface in a humid and unproductive state. No sort of drains, though executed with the greatest care, and conducted with the utmost skill along the bog, can lay it effectually dry for the purposes of culture. Money may be expended without limit; the plan of leading and combining the drains may be varied without end, and all will be unprofitable and hopeless labour. The reservoir below the first stratum of clay must be dislodged before the smiling verdure of the meadow can recompense the toil and outlay of the improver. And this can only be achieved by *tapping*. An auger of a peculiar form and construction must pierce the clay in several places, and make way for a copious and necessary discharge. From each hole the water will shoot up as in a jet d'eau, and rise to an elevation exactly proportioned to the superincumbent pressure. This process of tapping is the grand modern discovery which has thrown upon the system of draining a new and brilliant light, and made the science of geology subservient to the progress and advancement of Agriculture. It is now incontestibly established that wetness proceeds as much from internal as from external water, and

that no small share of judgment is essential for noting the symptoms and drawing between the two an exact line of demarcation. The Roman writers DeReRustica appear to have been impressed with the utility of draining, and were not far behind us in the knowledge of the art of forming both open and covered drains, as is proved by Cato, Palladius, Columella, Varro and Pliny; but their methods were all directed to get rid of the wet which either burst out or ran on the surface. They had no conception of those secret and subterraneous stores of water which lay pent up in the bowels of the earth and endeavoured to force themselves upward by the pressure from behind. This improvement was left to modern times; and the name of Elkington, who, by a lucky chance, made the discovery in 1764, is familiar to the ear of every agriculturist. The honours which he won were long disputed by Dr. James Anderson, who has benefitted the world by many useful and ingenious publications on rural affairs, but common consent seems now to place them without any further hesitation on the brow of the former, on the ground of priority of discovery. The following narrative, copied from the second volume of the General Report of Scotland, page 464, briefly sketches the history of the fact, and tends also to set the matter forever at rest between the two rivals:

"In the year 1763, Mr. Elkington was left by his father in the possession of a farm called Princethorpe, in the Parish of Stretton-upon-Dunsmore, and County of Warwick. The soil of this farm was so poor, and in many places so extremely wet, that it was the cause of rotting several hundred of his sheep, which first induced him to try, if possible, to drain it. This he began to do in 1764 (consequently ten years prior to Dr. Anderson's publications), in a field of wet clay soil, rendered almost a swamp, or shaking bog, by the springs which issued from an adjoining bank of gravel and sand, and overflowed the surface of the ground below. To drain this field, he cut a trench about four or five feet deep, a little below the upper side of the bog, where the wetness began to make its appearance; and after proceeding with it in this direction, and at this depth, he found it did not reach the principal body of subjacent water from which the evil arose. On perceiving this, he was at a loss how to proceed, when one of his servants came to this field with an iron crow or bar, for the purpose of making holes, to fix sheep hurdles, in an adjoining part of the farm. Having a suspicion that his drain was not deep enough, and desirous to know what strata lay under it, he took the iron bar, and having forced it down about four feet below the bottom of the trench, on pulling it out, to his astonishment, a great quantity of water burst up through the hole he had thus made, and ran along the drain. This led him to the knowledge that wetness may often be produced by water confined further below the surface of the ground than it was possible for the usual depth of drains to reach, and that an auger would be a useful instrument to apply in such cases. Thus, chance was the parent of this discovery, as she often is of other useful arts; and fortunate it is for society when such accidents happen to those who have sense

and judgment to avail themselves of hints thus fortuitously given. In this manner he soon accomplished the draining of his whole farm, and rendered it so perfectly dry and sound that none of his flock was ever after affected with disease.

"By the success of this experiment, Mr. Elkington's fame as a drainer was quickly and widely extended, and after having successfully drained several farms in his neighbourhood, he was at last very generally employed for that purpose in various parts of the kingdom. From his long practice and experience, he became so successful in the works he undertook, and so skilful in judging of the internal strata of the earth, and the nature of springs, that with remarkable precision he could ascertain where to find water, and trace the course of springs that made no appearance on the surface of the ground. During his practice of more than thirty years, he drained in various parts of England, particularly in the midland counties, many thousand acres of land, which, from being originally of little or no value, soon became as fertile as any in the kingdom, by producing the most valuable kinds of grain, and feeding the best and healthiest species of stock."

But tapping has been experienced not only effectual in giving vent upward to the adjacent water, but also in opening a passage downward for what stagnates and flows on the surface. The reason of this may be easily and succinctly elucidated. Clay principally is the bed which intercepts the descent of moisture in the earth. It, however, is often of no great thickness, and beneath it lies either a loose and porous stratum or a rock abounding with chinks and fissures. By perforating the clay with an auger in appropriate places, any number of holes may be made through which can escape the injurious moisture and leave the surface dry. This happy application of the new principle has already been resorted to in several counties both of *England and Scotland, and all with equal success. In the Agricultural Report of Roxburghshire the following account is given of draining ground in a land-locked situation, from whence there was no practicable outlet but by boring downward and reaching a lower stratum of a permeable nature. It may be necessary to premise that "from one to six feet below the surface of the waste lands, that might be made arable in this country, is found a large seam of black slaty or metallic substance, generally from twenty to twenty-five feet in thickness, and below this again, a mass of whinstone rock, both lying in a tolerably regular straight line. The thickness of the whinstone rock is unknown, as I have not heard it was ever bored into. The black slaty substance is so closely cemented that it is impenetrable to water or any other liquid; while, on the contrary, the whinstone abounds with gaps, and will receive and swallow up any quantity of water poured into its bosom. In the end of October I ploughed up twenty acres of this waste land, and with a good deal of trouble and expense gathered it into ridges pretty high in the following mid-Summer, in order to come

*Agricultural Report of Hertfordshire.

down to the slaty metallic substance. I soon found that the water stagnated in the hollow of the ridges, these being at least four feet below any level I could obtain. To remedy this inconvenience, I got a pair bore-rods, which I put down the slaty substance to the whinstone rock at sundry places, keeping the top of the holes covered with a basket of loose stones. This plan succeeded to my utmost expectations, and next Spring I had the pleasure to find my land was in a condition to sow as early almost as any other part of my farm."

This practice of boring is now generally adopted throughout the whole of England, and its efficacy has been confirmed by the experience of half a century. Indeed there is no other method by which stagnant water in low situations can be disposed of; and before its invention the noisome morass was accounted unimprovable, and there existed not the faintest hope of converting it into a useful meadow.

A plan somewhat analogous to this in prinriple but different in execution has long prevailed in some parts of *Germany, and which evinces that the human mind, when contending with difficulties, naturally falls on the same resources and endeavours to subdue them by accommodating like means to ends. In place of boring a number of small holes with an auger or rod, to reach the porous stratum, the German agriculturist sinks a pit of large diameter in the lowest ground adjoining the morass intended to be drained, and this he fills with broad stones, set on edge, so as to leave interstices for carrying down the water. Towards the mouth he lays the stones in a flat position, and then covers the whole up with coarse gravel intermixed with sand. The main trenches cut through the bog all terminate in this point, which absorbs the superfluous moisture, provided care has been taken in its construction.

The important subject of draining is far from being exhausted by those cursory remarks, and at present I shall not extend them, because another opportunity will occur for giving it a more leisurely and mature survey.

AGRICOLA.

Halifax, May 28, 1819.

GOVERNMENT HOUSE,
Halifax, May 28th, 1819.

SIR,—I have it in command from His Excellency the Earl of Dalhousie to communicate to you the enclosed extract of a letter from Mr. Atcheson, Colonial Agent.

I have the honour to be, sir,
Your most obedient humble servant,
G. COUPER.

JOHN YOUNG, ESQUIRE,
Secretary of the Provincial Agricultural Society.

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†Dr. Nugent's Travels in Germany, 1766.

Extract of a letter from N. Atcheson, Esquire, to the Earl of Dalhousie, dated—

LONDON, 7th April, 1819.

"I have taken the liberty to address Your Lordship a complete series of the transactions of the Society for the Encouragement of Arts, &c., at the Adelphi, London, consisting of upwards of 30 vols., which I beg Your Lordship will condescend to present in my name to the Agricultural Society lately established under Your Lordship's auspices at Halifax, as a token of the warm interest I feel in every measure which is likely to promote the welfare and prosperity of the Province."

I have the honour to be, &c., &c.,

NAT. ATCHESON.

True Extract—G. COUPER.

REMARKS.

The valuable donation of Mr. Atcheson to the Provincial Society, through the medium of its noble President—the Right Hon. the Earl of Dalhousie—aunounced in the preceding notes, will be highly acceptable not only to the members, but to the community at large. The work is of great value, and from the variety, accuracy and extent of its details, it will answer the purposes of reference in most of the arts and sciences. This act of kindly interest in our prosperity demonstrates that our late efforts have met with approbation, and that, in the opinion of the giver, a knowledge of the transactions of a distinguished society for the encouragement of the arts will illuminate our path and serve to accelerate our progress. Without doubt the formation of an Agricultural library is indispensable to the success of our whole plans, and to this subject I would have much earlier turned the attention of my readers had I not been confounded by the open and unblushing avowal of sentiments unfriendly to books in the House of Assembly. Some appear to have thought that Agriculture required nothing save the brawny arm and the swarthy brow, and that any application of the funds to procure those writings which have laid the basis and directed the practice of this art would be a vain and unprofitable waste of the public money. In opposition to these mistaken and narrow conceptions I hold that without the benefit of extensive reading and the study of physical science no man can prefer the least pretensions to the character of an Agriculturist. Indeed, I know no other pursuit of human life which is so closely allied to all those ennobling and delightful researches that exalt our nature, and expand the intellectual faculties to their full dimensions. The calling of a farmer is beginning to be ranked among the learned professions; chairs are founded in the different universities for teaching it; its publications are the favourite companions of all classes; geology, chemistry, the laws of vegetable and animal life, physiology, the veterinary art are merely handmaids and assistants, and its illustrations and details must be borrowed from

the whole circle of the sciences. Can this varied information be gathered without reading and without books? Can we know what is going forward throughout Europe in this grand and universal pursuit which embraces the interests of the human race without consulting the proceedings of the different societies established in the several kingdoms? I hope that this costly gift—the first of our infant library—will waken in our minds better feelings, and teach us that by the perusal of such works, joined to a diligent pursuit of physical knowledge, we can alone expect to become enlightened and scientific farmers. An ignorant boor may *turn up* the ground, but it is only a wise man who can *cultivate* it.

The thoughts sent me on the drill husbandry will be perused with interest, and although they are neither new nor original their importance induces me to give *them a place in my correspondence. I have already taken so many opportunities to recommend the introduction of this system that it is the less necessary to dilate on the present occasion; yet I cannot help expressing my regret that a respectable society addressed me last week, as secretary of the Board, on the subject of changing the prizes held out for the drill culture of turnips, because, forsooth, there were no proper articles of machinery in the county. The main purpose of giving these prizes was to furnish sufficient inducement to the farmer to fabricate or procure them; and an ill-timed compliance with this wish would have defeated all the anticipations of the Board, set a seal on our agricultural degradation, and even raised an effectual barrier against the further advancement of that particular county.

JOHN YOUNG, *Secretary.*

*In the present volume I have omitted this correspondence agreeably to my general plan of throwing out everything of only secondary moment.

No. 37.

THE capacity of cultivating and improving the earth is without question the most splendid prerogative of that sovereignty over creation with which man is invested. By the continued and unceasing efforts of his power he converts the wilderness into fruitful fields, the unhealthy fens into verdant meads, and the solitude and dreariness of the desert into the hum and bustle of the populous city. The wild beasts of the forest disappear at his approach, and shun the dwelling which he rears for shelter and protection. The tyranny which they exercised over the weaker animals is broken by the interposition of his authority, and he extends his powerful aid to such creatures as can add to his enjoyment, lighten his labours or share in his pleasures. This exalted dominion over nature seems to be the exclusive and peculiar privilege of the human race, and marks more than anything else their high and elevated place in the order of being. The most ancient monuments of history, the most marvellous tales of travellers, the records of the most distant nations, and even the wildest legends of romance ascribe to man the precedence over all other animals, and set him at the head of this lower world. These sentiments contain the language equally of sacred and profane writers; of early and of later times. David, in that beautiful hymn, which breathes at once the spirit of devotion and the ardour of poetry, gives his testimony to this truth: "Man, thou hast made a little lower than the angels; Thou hast crowned him with glory and honour; Thou mad'st him to have dominion over the works of Thy hand; Thou hast put all things under his feet, all sheep and oxen, yea, and the beasts of the field, the fowls of the air, and the fish of the sea."

When we traverse the surface of our globe, when we enter into the boundaries of ancient empires and behold their fragments of fallen and perished grandeur, we attribute whatever meets the eye or fixes our admiration, and this at first sight and without any process of reasoning, to the exertions of human power. It was man that built the magnificent City of Palmyra, whose present ruins cast on the desert a faint gleam of its departed glory; that piled in the Plains of Grand Cairo those huge and permanent structures which have defied the ravages of time and descended from an unknown antiquity; and that reared and consecrated those temples of various form and workmanship which are scattered over the East and have survived the gods and the religion whose name and rites they were meant to celebrate.

If to human agency all these stupendous works are to be ascribed, so also to the same cause are owing the embellishment and culture of the earth itself. None of the irrational tribes possess the gift of forethought, of well-directed labour, or of applying apt means to the com-

pletion of important ends. They are guided by *present feelings and by present objects, or, as the philosophic Sallust expresses it, †"natura ventri obedientia finxit," nature has rendered them obedient to the appetites. When propelled by hunger, they seek for food, or when languishing under heat, they retire to the cooling shade. Those particular displays of skill which belong to some classes, more especially in making provision for Winter and the preservation of their young, have been referred to instinct rather than to reason, as in every other respect, they manifest a dullness and stupidity which are the true characteristics of the brute. Man alone of all animals can lay a plan of conduct, can apply his ingenuity and labour to useful purposes, can bend the laws of matter to his will, can cultivate the earth and lay up stores for old age. The aspect of the country which he inhabits is transformed by the irresistible influence of his perseverance; its fertility is called forth by the multiplication of his kind, and he secures and perpetuates his empire by the introduction of all those liberal and necessary arts which serve to ornament or utility. In short, the improvements of land, and the consequent changes they induce in society, belong to man as his peculiar province, in contradistinction to all other animals, and the principal manifestation of his power consists in subduing those natural obstructions to tillage which exist in every rude country.

That the attention of this community may be more generally turned to this subject, I mean to set apart the present and the next letter for some considerations involved in the clearing and improving of land, and which may be regarded as corollaries from the general doctrines.

Agricultural improvement in all its stages, from the cutting down of the forest to the final and complete subjugation of the earth under the plough, including levelling, draining, fencing and every other operation, may be viewed in four great lights—as it effects the individual; as it affects society; in reference to national wealth, and as an employment of capital. On each of these heads I shall offer a few remarks:

I. The poets from the days of Horace down to the present age have chaunted the pleasures of a country life, and vied with each other in painting a subject so suspectible of ornament. One has only to open their compositions at random, and be sure of finding something agreeable said on this interesting topic. The fragrance of the bursting blossom, the softness of the breeze, the wild notes sung to the listening waste, the falling of the showers scarce heard to patter, are only a

*Inter hominem et belluam hoc maxime interest; quod haec tantum, quantum sensu movetur, ad id solum, quod adest, quadque praesens est, se accommodat, paullulum admodum sentiens praeteritum aut futurum: homo autem; quoniam rationis est particeps, per quam consequentia cernit, causas rerum videt, earumque praegressus et quasi anrecessiones non ignorat, similitudines comparat, et rebus praesentibus adjungit atque annectit futuras, facile totius vitae cursum videt, ad campue degendam preparat res necessarias.

Cicere De Officiis--Liber Primus.

†Salustii Catilina, Ch, I.

sample taken from the thousand images which they have scattered in rich variety, and by which they have given to their verses the glow and animation of poetic fervour. Our Thomson touches this theme with his usual sweetness:

> Oh, knew we but his happiness; of men
> The happiest he! who far from public rage,
> Drinks the pure pleasures of the *rural life.*
> Sure peace is his; a solid life estranged
> To disappointment, and fallacious hope;
> Rich in content; in Nature's bounty rich,
> In herbs and fruits; whatever greens the Spring,
> When heaven descends in showers; or bends the bough,
> When Summer reddens, and when Autumn beams.
> Here too dwell simple truth; plain innocence;
> Unsullied beauty; sound unbroken youth,
> Patient of labour, with a little pleased;
> Health ever blooming; unambitious toil;
> Calm contemplation, and poetic ease.

But it is unnecessary to borrow from poetry her fine and enchanting illusions in order to set forth the praises of a rural life, and engage men, from a regard to pleasure, health and tranquil enjoyment, in the pursuit of Agriculture, because in this Province, from its wild and uncultivated state, much of the description is inapplicable; yet there want not reasons peculiar to ourselves, and pleasures which in a certain sense may be styled our own, to furnish motives for embarking in this line of industry. A settler, sunk in indigence and devoid of all the previous training necessary to constitute a farmer, must undergo many privations and encounter innumerable difficulties which are not the necessary concomitants of his lot. He labours under the pressure of want, which of itself is enough to corrode his comfort and embitter his enjoyment. With the forest he has to struggle for subsistence; and content with mere necessaries, he is not in a condition to acquire a relish for convenience, far less for refinement. Around his cottage he cannot spread an air of neatness, for his whole attention is kept on the stretch to answer the calls of nature, which must be first satisfied before the more elegant pleasures of the imagination can be safely indulged. Everything connected with him—his dwelling—his barn—his fences—the irregular shape of his fields—his patches of culture—bespeak that poverty which modifies alike his feelings and his conduct. Whatever were the situation of such a man, it must be cheerless and uncomfortable, and this arises from the meanness of his circumstances, not from the nature of his calling.

But the improver, who possesses the means of enterprise, is in a far different condition, and to him plans of amelioration may become the purest sources of satisfaction. Abstracted from all ideas of profit, there is an inward complacency in these peaceful pursuits which spreads a calm over the mind and tends to hush the ruder passions. The

strifes of ambition, the torments of rivalry and the contentions of gain follow not the track of the plough; these dwell in the crowded city and the busy scenes of active life.

Furthermore, it is natural for man to take a deep interest in the schemes of improvement which he has devised and executed. The house he has built—the fields he has cleared—the well of water he has dug—the garden he has laid out and planted—touch his heart and insensibly draw his affections. He views them as the works of his own hand; fancy flings over them her bewitching drapery, and he contemplates himself as having exercised, to a certain extent, the attributes of a creator. These local attachments, founded in the deceptions of the heart, although inexplicable to reason, are the secret sources of sensibility, and repay in pleasure the toils and labours of husbandry. Agricultural pursuits, as far as the individual engaged in them is concerned, exert a friendly influence on his contentment, tranquility and health, besides opening up many springs of innocent and unalloyed enjoyment. In Europe they are the relaxation of the nobleman and the retreat of the philosopher. The merchant or manufacturer whose mind has been broken down by the cares of business regards them as the solace and employment of his maturer years, and accounts himself happy when he can escape from the smoke of the city to inhale the fresh air of the country. Here, on the contrary, all our feelings are in arms against farming; its labours are considered toilsome and inglorious; its pleasing studies are disregarded and unknown, and its simple joys, from being untasted, are not rated according to their worth. The ornamental pleasure-ground—the shrubbery—the lawn—the tasteful villa—the substantial family-seat—are as yet terms without import, and many of our capitalists choose rather to saunter away an idle existence in the metropolis, than busy themselves in those delightful occupations which better the heart, while they embellish the country.

II. I remark that the cultivation of land has a mighty effect on the progress of society. The increase of human food leads to the multiplication of the species, and every improvement in Agriculture, by which the earth is rendered more prolific, paves the way for a new race of beings. It has been computed that the population of any State, where the means of subsistence are within the reach of ordinary industry, will double itself within twenty years, and it is maintained that when the progress of society does not keep pace with that ratio, it must be impeded by the agency either of positive or preventive checks. It is obvious, without any reasoning, that scarcity of food must operate against the multiplication of mankind, and that a country which is incapable of supporting its inhabitants must march more slowly in the augmentation of its numbers. Not to mention the discouragements which must exist against early marriages, and the hazardous professions in which young men embark to procure employment, there are many powerful temptations to abandon such a country and seek in more favoured regions that plenty which is there denied. The

deficiency of our agricultural produce compared with our internal consumption must have retarded, since the first settlement of the colony, the increase of our population; and although, on the whole, we have been advancing, yet our progress has been much less rapid than it would have been under more favourable circumstances. The emigrant on his first arrival naturally surveys everything with an anxious and searching curiosity, and the sight of flour and other produce landing from the States naturally begets a desire of visiting a country so abundant in bread-corn. This circumstance, trivial as it may appear, has lost us the advantage of that general emigration to America which the late wars and distresses of Europe have occasioned, and will continue to operate while we depend so much on our neighbonrs for a supply.

But there is another point of view, in which the improvement of land may be contemplated as it affects society, that ought not to be overlooked, and which is, independence with regard to the maintenance of our existing population. This has been the grand object at which Great Britain has been aiming in the whole structure of her corn-laws. By regulating the importation of grain and by shutting her ports entirely when prices fell to a given limit, it was not her purpose, as the ignorant and disaffected foolishly represented, to oppress the poor and uphold at their expense the landed interest; but the design of this policy was, incidentally to afford encouragement and protection to Agriculture, and really to enable the national territory to support the national population. Thus only could the independence of the country be accomplished; thus could the augmentation of the people be influenced and limited by the means of subsistence; and thus could the British Empire, though cut off from continental and indeed from all foreign supplies, assume the imposing attitude of attack or resistance. In this Province we have been so long inured to lean on others for bread that we could not tolerate any system of corn-laws—any tax however moderate on imported produce, and the most distant approach to such a measure would create murmuring and discontent. The manly and noble sentiments of Britons, in consequence of our long abject prostration at the feet of the States, have been extinguished in our bosoms; we have no ardent sighing after independence, but, like Esau, "for a mess of pottage we have sold our birth-right." That country which feeds not itself is doomed to poverty and degradation, and like a satellite must move in the train and obey the impulse of its primary and presiding planet.

III. The improvement of land may be viewed also in reference to its influence on national wealth. The great sources of public prosperity are land and labour, and although various theories on this subject have divided the opinions of men in different ages and nations, yet the moment they descend to facts and illustrations, they are obliged to acknowledge that the industry of a country and the extent and condition of its territory are the two grand fountains which give out a revenue to the great body of the people. The earth has been assigned

to the human race as the place of their habitation, and their first duty is to draw forth its richness and the productive powers of vegetation. In one sense, it is the origin of all wealth, public and private. Its surface is clothed with a natural and constant verdure by which are fed the animals tamed for our use or slain for our table; and by culture it yields corn and roots—the principle articles of human food—and also those multiplied products, which are the raw materials of manufactures and commerce. Its bowels furnish the precious and useful metals; its mountains, minerals of various kinds and stones of costly value; its woods, the timber which enters into the construction no less of the ostentatious palace than of the lowly hut; and its seas, that store of fishes which constitute a grateful supply to the wants and tastes of many nations. But it is allowed on all hands that the principal source of opulence lies in the cultivation of its soil. The energy of the vegetable principle works there a sort of creation, which regularly replaces the waste of the annual consumption, and keeps up the stock of the national wealth unimpaired. The rate of increase and return varies with the skill and capital employed; and the supremacy of man comes in here to regulate, assist, and, in some measure, to overrule nature. Land under a judicious course of tillage seems to possess this peculiar property, which points it out as the prime original of national wealth—that, besides restoring the seed and supporting the labourers employed in its cultivation, it furnishes a surplus which may be paid over to the landlord in shape of rent, or to the government in that of taxes. It is this surplus which reproduces and augments the national stock, and entitles land, by way of eminence, to be styled the parent of prosperity. If the soil could merely replace in Autumn the seed sown in Spring, and as much more as was barely sufficient to pay the wear and tear of implements and the expense of the labourers, it is manifest that although it might be the means of private subsistence, from it no stream could issue to swell the public resources. But in every well-cultivated region it affords a suplus, more or less, which gives it a distinction beyond manufactures, and was the principal circumstance that led to the celebrated theory of the economists, who at one time comprehended almost all the philosophers of France and many of Europe. Quesnai, who was the founder of this ingenious and simple but unsubstantial system, maintained that land was the sole origin of public wealth, inasmuch as it created a fund over and above the seed and labour, to be disposed of either to a proprietor or to the government. Manufactures and arts were represented as barren and unproductive, because although they added an increased worth to rude produce and enhanced its price in the market, they contributed nothing in reality to the national wealth. A manufacturer, said the advocates of this theory, may work a pound of cotton into a piece of muslin which may bring a hundred times the cost of the raw material; yet during the time of his labour he requires to be supported from the agricultural stock of the community; and when his consumption is estimated and compared with the additional value of the article, it will

be well if the national wealth has not suffered defalcation, in place of being increased. The manufacturing classes do nothing more than fix and realize in some saleable commodity the value of their own consumption ; the amount of bread which they eat is transferred to the products of the industry ; but they possess not, like land, any creative power, by which to augment and multiply the national stock. The sole object of the various mechanic arts is to furnish employment for the superfluous members of a State, and put them under the necessity of producing as much as they consume ; but this is the extent of their utility. The surplus agricultural produce, in place of being devoured by useless drones or idle retainers, is by this contrivance converted into the elegant productions of the arts—into articles of iron, steel or brass —of flax, silk or cotton. The superiority of land, say they, above manufactures depends on the principle of vegetation. Here an energy, which occasions no waste and needs no repair, is perpetually at work to fashion into use the various articles of the soil, and deliver them over, perfect and complete, to the husbandman at harvest ; whereas in manufactures an expensive and purchased power—that of human labour—must be constantly employed, and which requires a full equivalent for its services. Vegetation, on the contrary, is free and unbought. It demands no implements by which to operate ; no food to sustain and renovate its vigour ; no reward on the score of wages. This then is the sole and exclusive source of the wealth of nations, and all others are artificial and visionary.

Without entering into a *refutation of this specious theory, suffice it to remark, that although it certainly pushes the main principle too far on which the reasonings turn, yet unquestionably the surplus produce of Agriculture is the grand and primary fountain of public opulence. This surplus by most political calculators is allowed to be a third ; but none estimate it at less than a fourth of the whole crop. Neither mines, nor fisheries, nor manufactures, could spare such a proportion in name of rent ; and if such were demanded either by proprietors or by government, they would of necessity be abandoned, and the industry engaged in them forced to take some new direction. The precious mines of Mexico and Peru pay some of them, only a twentieth of their produce ; all fisheries are free, if we except those of some particular rivers ; and manufactures, in place of being able to maintain themselves generally, are propped by monopoly, exclusive rights, or other legislative protection. It is land alone which throughout Europe supplies the fortunes of individuals and the lavish expenditure of governments.

*In Smith's 3d vol. of the Wealth of Nations, page 30, there is a very unsatisfactory attempt made to controvert the conclusions of this elaborate and well-balanced theory. He has missed the clue which unravels its intricacies—a most singular defect in this writer, who has thought so profoundly and reasoned so justly on his subject. The answer is : the mechanic powers in manufactures are as productive of wealth and as free and unbought as vegetation ; and the capital employed yields a rate of interest not less than that payable to the landlord on account of rent.

But no argument places in a more illustrious point of view this fundamental truth than the public estimates for the present year submitted to the Committee of Finance by Lord Castlereagh on the 12th of February last. His Lordship states that the income of the country for the year ending January 5, 1819, that is, the amount of revenue collected by taxation, rises to the sum of £54,063,000, which exceeds last year by an increase of £4,146,000. Whence, I ask, is this enormous amount of income derived? It has usually been answered that the manufactures and foreign trade of Great Britain are the mainsprings of this unequalled opulence and the grand pillars of her stability. In the same accounts is given the value of her whole exports for the last year, and this only comes to £35,325,000, being above three millions more than that of the preceding year, and above £160,000 more than the year 1815, in which the exports exceeded those of any former year by £10,000,000. The boasted trade of Britain, then, which has without doubt surpassed that of any nation on record, is not the cause of her vast wealth, for the government alone draws annually from the people more than the whole value of her export trade.

On these few data much important reasoning might be built, but there is one conclusion of pre-eminent interest to be drawn, and which is supplementary to my main argument. It is the Agriculture of Great Britain more than her manufactures and commerce which has swelled her resources, magnified her power, and supplied the expenditure of her foreign operations. China is a great, rich and powerful empire by the mere force of Agriculture, for all foreign trade is intentionally discouraged. The preponderance of France and the weighty grandeur of Germany rest on the basis of the plough; the American States have risen in importance by the same means; and Nova Scotia is poor, because from a false and pernicious estimate of her soil and climate, she has hitherto neglected her true, her best, her only interests.

AGRICOLA.

Halifax, June 3, 1819.

TO CORRESPONDENTS.

I am happy that the call made on my old friends has not been unavailing. Several letters have reached me this week of great interest, and the information conveyed will appear in its proper place. A monthly agricultural report for Cumberland has been received and will be printed next Saturday.

AGRICOLA.

No. 38.

IN my preceding paper I finished the consideration of the three first great views connected with the improvement of land, and I contemplated the subject, as it affected the individual—as it affected society—and as it served to produce and augment the national wealth. The last head, which was to treat of the employment of capital in this walk of industry, I reserved as the groundwork of my present letter; and I did this that I might have room for this important discussion, and expatiate at greater length and with more freedom in this ample field of political economy.

The annual produce of the land and labour of every country naturally divides itself into two parts—that which replaces the stock of individuals, and thus keeps up and sustains the national capital; and that which constitutes private revenue and is destined for consumption. The first of these can be increased by parsimony, or diminished by extravagance and profusion; and in proportion as the members of a community suffer themselves to be governed by these opposite principles, the national wealth is either in an advancing or declining state. Capital, in whatever shape it is held or however vested, should always be set apart for the maintenance of productive labour, and be employed to produce a revenue to the owners. It is the fund consecrated to provide subsistence; and although there be a few prodigals, the bulk of mankind will guard it with a scrupulous and constant vigilance. So eager after it is the pursuit that its increase seems to form the business of life, and men are styled fortunate or unfortunate, prudent or imprudent, according to their success in the rate of accumulation. It is distinguished from income or the sum destined for immediate use by this striking peculiarity, that it should be held sacred and inviolate, and never be appropriated to the support of unproductive hands. He is the spendthrift who perverts it in this manner. He seizes, as it were, the revenues of some pious establishment, applies them to profane purposes, and pays the wages of idleness with what his progenitors had devoted to the maintainence of industry.

The capital of every man forms a constituent part of that which belongs to the whole nation, or, in other words, the national stock is merely the aggregate of those capitals held by individuals. Whether these be lent on interest or retained by the original possessors, they seem capable of being employed only in *four ways: First, in procuring the rude produce required for the annual consumption of the society; secondly, in preparing and manufacturing that produce into articles of necessity and convenience; thirdly, in retailing out to the consumer, according to his wants, small portions either of the rude produce of land or of the manufactured commodities of art; and lastly, in transporting these various productions, when in excess, to other

*Smith's Wealth of Nations, Book 2d, Chap. 8.

places where they may be in request. In the first way, are employed the capitals of all those who undertake the working and improving of lands, mines or fisheries; in the second, those of manufacturers and artists; and in the two last, those of retailers and wholesale merchants. It is impossible to conceive any employment of capital which will not be comprehended under one or other of these classes.

In every State, where the principles of human nature are allowed to expand themselves without either encouragement or constraint, a natural order will take place in the development of capital. Men will not betake themselves indifferently to either of these four modes of employing their time and attention, but will evince a predilection in obedience to the dictates of interest and necessity. The most pressing wants of the State will require to be first satisfied, and to these the common stock of labour and capital will be principally directed. Agriculture will thus naturally absorb the greatest portion of attention, in order to appease the cravings of hunger—the most clamorous, unceasing and urgent demand of nature. Everything will be neglected as of minor importance till this primary object be secured. The trades and arts which are subservient to it will arise at the same time; but all those manufactures which affect elegance and refinement and taseful decoration are of much later growth. The mason, the carpenter and the smith make their appearance long before the engraver, the dyer or the painter, and in truth the abstraction of the national capital to any of these politer arts, till the means of subsistence are in plenty, is impolitic and prejudicial. Food takes precedence of all the other wants of nature, and the whole genius of the society should be bent this way, till there be, if not a surplus, at least a sufficiency. This is obviously pointed out as the natural course of things, and when the principles by which men are connected together in the social compact are allowed to operate without restraint, the industry of the country will pre-exist before that of the town.

When we bring along with us these general views, and open the page of history, we find them abundantly corroborated in every region of the globe, unless where the legislator has unadvisedly interfered, to derange the natural order. In ancient Egypt the arts of Agriculture were carried to the utmost pitch of perfection; the whole country was intersected by artificial canals for conducting the waters of the Nile; the fields were cultivated like a garden, and in this soil the manufactures, which should follow but not precede the plough, took root and prospered vigorously. The same progress of society may be remarked in the earlier Asiatic empires founded in Nineveh and Babylon. The arts, which embellish life and minister to luxury, were nursed on the banks of the Euphrates and the Tigris, after they were cultivated and highly improved; and the first accounts of these mighty rivers concur in representing an extraordinary perseverance in forming conduits and in raising water by wheels, to the end that this rich and populous region might be fertilized. Zoroaster even contrived to make the culture of land the first of religious virtues. In the Zendavesta we

have a wise and beneficient maxim, which atones for many an absurdity, "He who sows the ground with care and diligence attains to more religious merit than by the repetition of ten thousand prayers." In the Spring of every year a festival was solemnized, with a view to picture the primitive equality and the first and most important labours of mankind. On that day, the husbandmen were admitted, without distinction, to the table of the Kings of Persia, seated in the midst of their Satraps, while the Monarch addressed them in this language: "From your labours, we receive our subsistence—from our vigilance, you derive your tranquility; and since we are mutually necessary to each other, let us live like brothers in concord and love. You are the most valuable of my subjects, and I am disposed to honour you." When the Spaniards, on the first discovery of America, entered the kingdoms of Mexico and Peru, they found them considerably advanced beyond the savage state, and inhabited by a people in that middle stage of society which occupies the place between Agriculture and manufactures. The first had made a moderate progress, and furnished support to the splendours of royalty, and to a train of civil and military officers; the last were in their infancy, and their most perfect productions were decidedly inferior to the rudest specimens of European art.

But it is superfluous to run over either ancient or modern history in confirmation of this doctrine, as it must be apparent on the slightest reflection that the necessaries of life will always take place of its conveniences, and that mankind will secure the one before they exert themselves or indeed discover a relish for the other. The natural progress of opulence in every free state, where the laws and institutions neither accelerate nor obstruct the development of industry, seems to be: first, the introduction of Agriculture and the rise of the more essential mechanic trades which confine their attention to the local wants of the community; next, the erection and increase of towns, swarming with artificers, manufacturers and retailers; and last of all, foreign trade, which exchanges the home superfluities, both of nature and of art, for those of distant nations. Conformably to this order, the capital of every community will be attracted primarily to its soil, then to the vulgar arts which supply the necessaries of life, next to the retail and internal traffic of the country, and finally to those extensive and elegant manufactures which arise in the last stage of opulence, and which aim at gratifying the rich or answering the demands of foreign markets.

Further, it may be observed that when things proceed in this natural tenor, the accumulation of national wealth is more certain and rapid than under any possible inversion of it, and that those legislative provisions, which have been enacted with a view to accelerate the public prosperity by changing this order, have uniformly proved injurious and ineffectual. During the decline of the Roman Empire, but more especially after its subversion, Agriculture was discouraged by that system of policy, which the barbarous invaders of necessity introduced. The rapine and violence which they exercised against the

ancient inhabitants suddenly checked and, in many cases, interrupted totally the peaceful pursuits of rural industry. Men fled to the towns for shelter from their fury, and the western provinces of Europe, which had enjoyed considerable share of tranquility and opulence under the Emperors, sunk into the lowest state of poverty, and from the turbulence of the times were often visited with all the horrors of famine. The chiefs and principal leaders of those German and Scythian hordes found a country which had been either wasted and depopulated by former invaders, or which was deserted, on their approach, by the timid and enervated inhabitants in order to escape the coming vengeance. They usurped to themselves as of right the lands, which they thus acquired by their swords, and which were left without a proprietor. To render their possessions permanent and hereditary, and to sustain their dignity and influence as the great officers of the crown, they fortified themselves behind a variety of legal entrenchments, which were either planned with great art, or owed their existence and success to a singular coincidence of circumstances. By the law of primogeniture these vast estates, which were acquired during this reign of terror and outrage, descended entire and unbroken to the eldest of the family; and by the invention of entails they were hindered from being alienated, and made to pass through a continued line of succession to the remotest posterity. Agriculture languished under the shackles which the Feudal System imposed upon it, and the progress of society in Europe, during the middle ages, bore evident symptoms of this thraldom and depression. The industry of mankind, precluded from the cultivation of the soil or engaged in it under manifold embarrassments, sought scope for its activity in trade or manufactures. Towns were erected and endowed by the sovereign, with certain rights and impunities as counterpoises to the exorbitant and overgrown authority of the barons, and in them we first recognize the beginnings of those arts, which have since been exalted to so great a height, and have rendered Europe the most distinguished commercial quarter of the world. The wealth amassed in these free and imperial towns, or boroughs, as they were sometimes called, flowed out upon the surrounding country in happier times; and thus husbandry was animated by those very manufactures, of which in the ordinary march of human affairs it ought to be the parent. The industry of the town, to borrow the language of Dr. Smith, gave birth to the industry of the country; and this inversion of the natural progress of opulence was the principal cause of the long and continued insignificance of the European kingdoms, and of their slow and sickly growth in fifteen centuries. Compare with them the rapid advance of the North American colonies, of which the wealth is founded in rural affairs. Through the greater part of Europe the number of inhabitants were not supposed to double in less than five hundred years; whereas in the United States the like increase took place in twenty, or, at most, in twenty-five. Of late since the introduction of the new machinery into Agriculture, and the amazing efforts to improve and perfect this art, the progress of popula-

tion has been quickened; and during the last century the inhabitants of the different European kingdoms are supposed to have nearly increased two-fold. When the capital of a people is destined almost exclusively to the multiplication of human food, the ease of living and the facility with which a family may be maintained, invite to early marriages, and also prevent those fatal diseases which originate in a penurious diet, and which carry off the young by a premature mortality. When the national capital, on the other hand, is principally directed to manufactures, and when there is a deficiency of agricultural produce in reference to the consumption, the great body of the people are pent up in towns, often in unhealthy situations, are dependent on foreign supplies which from their very uncertainty are often at an extravagant price; and thus from the difficulties of their condition and the precariousness of their subsistence, they feel the burden and constraints of poverty—at all times unfriendly to propagation.

But besides those particular causes which exalted the mercantile at the expense of the agricultural system in Europe, there are others by which the natural order of things may be disturbed. A great and powerful State, embarked in foreign trade and in schemes of conquest and aggrandizement, may found distant colonies for specific purposes in her general system of policy. It will then be her interest to direct the industry and capital of the infant settlement in subserviency to her own views, and to prevent her object from being defeated by the reaction of those principles which are ever propelling human affairs in their ordinary channel. Spain, for instance, established colonies in South America, principally for the purpose of working the precious mines from whence she expected to derive an inexhaustible treasure. Her subjects sent on this distant enterprize can be considered in no other light than as so many artificers hired or induced to enter into a particular manufactory, and were bound to obey the will of the master who employed them.

Great Britain too seems to have regarded Newfoundland as a fishing station and a suitable nursery for her seamen, and it would be inconsistent with the general welfare of the Empire to permit the capital of that island to be otherwise directed. In the original occupation of Nova Scotia the like plan seems to have been the ruling motive of action; and this first destination of the Province to carry on the fisheries has most probably impressed a bias on our feelings and given a particular turn to our industry. At the period of colonization this was a measure of enlarged policy. The New England States were in close union with the Mother Country, and could supply these colder regions with every necessary of life. Nova Scotia was the member of a great Empire, and in the immediate neighbourhood of colonies which acknowledged the same allegiance and were guided by the same counsels. Between them there could be no rivalship nor jealousy, as they sprang from the same stem, and were protected by the same laws. Now, however, the case is altered, and we should be swayed by different maxims. The revolutionary war has severed the New England

States from the parent country, and, of course, changed and modified all their foreign views and connections. To us they stand in a new relation, and our commercial intercourse is founded on a footing of separate and distinct interests. The traffic they carry on with Nova Scotia is not a mutual and beneficial exchange of commodities—it is not a liberal system of reciprocation—but is much akin to the dealings of a shrewd and opulent trader with a poor and dependent customer. The balance of profit leans too strongly on the one side.

Under these circumstances it is our business to point anew the direction of the national capital, and to strain every nerve in order to attain independence in bread-corn. Since we have been driven from the obvious and direct road of opulence, in consequence of the tendency impressed on our measures by the designs and views of the parent country in our first colonization, and since our relative situation has been reversed by the tide of human events, we ought without delay to retrace our steps and to pursue the dictates of a new and more appropriate policy. Without abandoning the fisheries in which we have attained some eminence, or the working of gypsum in which a part of our population have acquired skill and vested capital, let us turn ourselves with determined minds to the labours of husbandry; let us do justice to our climate, which is beneficent in the extreme, and despair not of accomplishing our utmost wishes by a proper display of energy. The prime sources of wealth are land, mines and fisheries, and nature, in the exuberance of her bounty, has thrown them all at our feet. Of these, land unquestionably holds the pre-eminence, and is entitled to chief attention. Our great error hitherto has been in exalting mines and fisheries above land, or rather in encouraging and promoting the former to the exclusion of the latter. Let us reverse this general system of conduct, let us recur to the natural principles of national opulence, let us mark and imitate the rise and progress of other States; and our prosperity will move forward with accelerated motion. By building the political fabric on the foundation of the plough, it will rise firm, proportioned and solid—will stand the rudest shocks and endure for ages. Like the house in the parable founded on a rock, the rains will descend, and the winds beat against it in vain. By raising from our own soil a sufficiency of corn for our internal consumption, a beneficial influence will be diffused over all the other branches of our industry. The price of labour must be uniformly regulated by that of subsistence, and the workmen can only accept of such wages as will enable him to live and rear a family. But labour can never fall to its proper level in a country that draws its supplies from foreign parts, because food *there*, to say nothing of the precariousness of occasional relief and the endless fluctuation of price, must be regularly higher by the full amount of energy, freight, insurance and a succession of profits. This additional cost falls on the wages of labour, and thus comes, in the end, to affect the market price of every commodity. Even the expense of catching fish and of digging plaster is augmented by this cause; and in fact the industry of the country in all

its ramifications is enfeebled by this canker in the system. While this state of things continues, it is idle to introduce into Nova Scotia any species of manufacture that can be imported, and all attempts of this kind must terminate in the ruin of the speculator. It would be misapplication of the Provincial capital to embark it in erecting works and machinery which prepare even the coarser commodities; and we must wait for half a century before we can prudently or successfully engage in them. Manufactures of no description can thrive in a soil that is unproductive in bread-corn. This is the first and most essential of manufactures and is the fountain of all the rest. It is the lowest step in the ladder of national prosperity, but on it we must throw our weight before we can ascend safely to the upper and more elevated. In consequence of our lamentable and now universally acknowledged inferiority in Agriculture we cannot even avail ourselves of the known and manifest advantages of the country. Ironstone we have in abundance, but we dare not work it; salt for the fisheries surrounds us on all sides, but we cannot by fire extract it from the ocean; our native furs must be sent home to receive the gloss of fashion and become the fit attire of female beauty; the coals of our mines, although among the bulkiest of articles, have maintained a price, on account of the high rate of wages, fully equal to those imported from Britain.

But it is needless to enter into such a long enumeration, as we can arrive at the same inference by a shorter road. Take any article which is made in the Province, and if you will, of materials of our own growth and of most abundance, and then ask and ascertain its price. If a piece of furniture, although lumber be of trifling value, it will be found, as it comes from the hand of the mechanic, fully 50 per cent. higher than the same article in Britain. Inquire into the cause of this, and you will learn that it originates in the dearness of living. A tradesman cannot subsist on moderate wages, and he must draw from his employer enough to answer his wants. This same cause affects the expense of building, and, of course, the rate of rents; it necessarily increases the profits of the importer and the retailer, and thus enhances British goods—the staple of our clothing, and in fact insinuates itself into every article of necessity or convenience. But why is living dear in a country blessed with a fertile soil and warmed by a genial sun? Because the national capital has not hitherto been directed to Agriculture, and this art, indispensable to prosperity, has been miserably neglected. We have dug plaster to fertilize the territory of our neighbours; we have cured fish to obtain rum and sugar; and we have parted with our every dollar to stave off beggary and starvation.

The cultivation of land is the only stable and permanent employment of capital; all else is perishable and liable to the vicissitudes of fortune. Where are the galleys which fought at Salamis? Where the merchandize of Tyre? Where the costly perfumes of Arabia? Where the riches and pride of Carthage? Worn by the corrosion of time, or consumed by the hand of the destroyer. The States of Asia Minor, the Republics of Greece, the Provinces of the Roman Empire, the

Roman Empire itself, have left no relics of their wealth, their magnificence and unrivalled prosperity, save the soil which they cultivated and improved. I shall not except from this general devastation the existing ruins of a few cities which are entirely useless to the present generation, and which serve only as memorials to teach us how fading and transient is all human glory. The capital, however, laid out on the soil is beyond the reach of fortune, and benefits alike the present and future age. When all other efforts of our industry in this Province have yielded to time—our ships—our wooden buildings—the frail apparatus of our fisheries—and the products of our mines—the land, reclaimed from the forest, will remain as the only unchangeable monument of our existence; and the capital there expended will have a duration coeval with that of the country. It will endure as the only permanent riches; and to sum up all, it is the Alpha and the Omega of national grandeur and wealth.

AGRICOLA.

Halifax, June 11, 1819.